

**Gas interconnector  
North Macedonia - Greece**

**CBA, Feasibility Study update,  
Environmental and Social Impact  
Assessment, Basic (detailed) Design  
and Tender Dossier**

**Supplementary ESIA Report**

**Addendum I  
Supplementary Biodiversity Critical Habitat Assessment  
Draft Final Report**

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**Technical Assistance to connectivity in the Western Balkans  
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## List of Abbreviations

Abbreviation	Meaning
AoI	Area of Influence
BCHA	Biodiversity and Critical Habitat Assessment
BAP	Biodiversity Action Plan
BMP	Biodiversity Management Plan
CH	Critical Habitat
CONNECTA	Technical Assistance to Connectivity in the Western Balkans
DG NEAR	Directorate-General for Neighbourhood and Enlargement Negotiations
EBRD	European Bank of Reconstruction and Development
EC	European Community
EIA	Environmental Impact Assessment
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plans
GCS	Gas Compressor Stations
GIP	Good International Practice
GIS	Geographic Information System
HDD	Horizontal Directional Drilling
HSE MS	Health, Safety and Environmental Management System
Mott MacDonald-CONNECTA Consortium	The Consortium carrying out the present project
NER	National Energy Resources
NNL	no net loss
NG	net gain
PBF	Priority Biodiversity Feature
PRs	Performance Requirements
RMP	Restoration management plan
RNM	Republic of North Macedonia
RoW	Right of Way
SEIA	Supplementary Environmental Impact Assessment
SLIP	Supplementary lenders information package
WBIF	Western Balkans Investment Framework
WFD	Water Framework Directive



## **Executive Summary**

Based on ESAS recommendation, a Biodiversity Addendum has been prepared. It contains two documents: Biodiversity & Critical Habitat Assessment and Biodiversity Action Plan, respectively. This is Biodiversity Critical Habitat Assessment for the North Macedonia section of the Greece-North Macedonia Gas Interconnector project. It provides an update to the original ESIA prepared by Connecta/Mott MacDonald in 2020 and is designed to be read in conjunction with that document.

### **Additional studies (Biodiversity baseline)**

Additional studies were undertaken to assess the potential impacts of the project including:

- An updated desktop assessment;
- Field validation of areas not previously surveyed (biodiversity survey and mapping of habitats is a 1,000-m wide corridor on the central line of the proposed gas pipeline);
- Biodiversity seasonal field surveys for various taxonomic groups: plants, birds, fish, herpetofauna, mammals, fungi, insects etc. within a timeframe of 4 months;
- Conducting targeted surveys for habitats such as: the Vardar river and its tributaries, ponds, forests (oak, riparian), forest clearings, meadows, pastures, limestone grounds, rocky grounds, etc.;
- Complete PBF and CH identification and mapping as per EBRD PR6 criteria;
- Invasive species identification and management plan; and
- Generating an expanded Habitats Map for all ecosystems and species that are a priority for conservation - Ecologically Appropriate Area of Analysis (EAAA).

These studies were undertaken by competent biodiversity experts and involve specialists for the different taxonomic groups. The findings of the studies above will help to: (1) identify if further pipeline route adjustments are necessary; (2) inform the impact assessment; and (3) define species and habitat specific mitigation measures.

### **Revised impact assessment (Assessment of Risks and Impacts)**

A revised impact assessment was undertaken to quantify and characterize the potential impacts resulting from the project. The purpose is to assess additional impacts on biodiversity associated with the Project, noting that impacts associated with the project have already been assessed in ESIA. This addendum BA includes:

- Critical Habitat Assessment;
- Characterization of ecological conditions of river Vardar;
- Comprehensive assessment of all direct, indirect and cumulative impacts of the pipeline construction/operation phases, including impacts of the access roads, material storage areas, quarries and individual river crossings;
- Comprehensive justification of sensitivity and magnitude ratings;
- Identification of impacts and risks on ecosystem services relating to forest clearance amongst others;
- Identification of required avoidance and mitigation measures as per the mitigation hierarchy; and
- Identification of potential risks, impacts and mitigation measures related to invasive species management.

### **Additional mitigation measures (Revised Mitigation Hierarchy Application and compensatory measures)**

This addendum recommends that additional mitigation measures be added to those previously prescribed in the original ESIA. Using mitigation hierarchy, generic and habitat/species specific mitigation measures for potentially significant impacts on all PBFs and CHs have been provided. Restrictions for sensitive areas and periods are discussed. Also, a BAP detailing Project mitigation and monitoring strategy, including itemized implementation programme, responsible parties and required resources is prepared. The BAP outlines a programme of reforestation and reinstatement of vegetation cover within the pipeline ROW and beyond.

The Project will achieve at least no net loss for the PBF/ Natural Habitats and net benefit for CHs. This would have to be demonstrated through a robust monitoring and adaptive management.

## 1. Introduction

The Government of the Republic of North Macedonia (RNM), as part of its national strategy for the development of the National Gasification System in the country, intends to construct an interconnector gas pipeline between North Macedonia and Greece. The promoter of the Project in North Macedonia is the National Energy Resources (NER). The Environmental and Social Impact Assessment (ESIA) procedure has been processed separately for the Greek section and the North Macedonia section of the interconnector. The ESIA for the North Macedonian section was prepared by Connecta/Mott MacDonald, reportedly based on EBRD's Performance Requirements 2014. Those, EBRD has engaged Environmental and Social Advisory Services Limited (ESAS) to undertake a critical review and gap analysis of the ESIA disclosure package to understand the extent of alignment with updated EBRD's Environmental and Social Policy (ESP) 2019 and identify effective and pragmatic actions to address any shortfalls to the Policy. Regarding the biodiversity issues, ESAS has identified that:

*"The ESIA does not meet EBRD PR6 requirements and contains various gaps concerning baseline, impact assessment and mitigation hierarchy application. Based on the current information over 50% of the pipeline ROW overlaps with several nationally and internationally protected areas some of which (i.e. Important Bird and Biodiversity Areas) constitute Critical Habitats in addition to numerous Priority Biodiversity Features, the impacts on which have not been adequately assessed. Additional studies are required to include (i) Biodiversity survey during at least two most pertinent sensitive seasons; (ii) Critical Habitat Assessment; (iii) Supplementary ESIA; and (iv) Biodiversity Action Plan."*

To align with the environmental standards of the principal lender for the Project to meet the requirements of EBRD's PR6, NER has undertaken a Biodiversity & Critical Habitats Assessment (BCHA) and Biodiversity Action Plan (BAP), as part of the supplementary lender's information package. This document BCHA captures additional studies, additional mitigation and management measures, and identification and assessment of impacts on Critical Habitats (CH), Priority Biodiversity features (PBF), while the mitigation measures are part of the BAP as a separate document. The Project Environmental and Social Impact Assessment (ESIA), supplemental ESIA, which are supplied separately, have been used to inform this document and should be read in conjunction with it. The legal aspects are described in the supp ESIA.

The objectives of the BCHA were to identify, map and describe the natural habitats affected by the project, determine whether critical habitat is present according to the criteria in PR6, describe the potential effects arising from the construction and operation of the proposed gas pipeline, and develop a Biodiversity Action Plan based on the appropriate use of avoidance, minimization, restoration or offsetting measures, as needed to ensure that there is no net loss (NNL) or a net gain (NG) of biodiversity as appropriate. The assessment of critical, natural and modified habitats was carried out on the basis of based on critical habitat definitions and criteria, following international best practices, and the 'spirit' of the EU Habitat and Bird directives, as required by PR6.

The specific objectives of the BCHA are to:

- Provide a whole-of-project biodiversity baseline, updated to include the results of new surveys and monitoring carried out within the Projects Area of Impact;
- Provide information to fill in data gaps of previous ESIA, including the identification of critical habitat, priority biodiversity features, legally protected and/or internationally designated areas etc.;
- Summarise the potential impacts on biodiversity receptors associated with the Project;
- Describe NERs proposed approach to manage potential impacts and risks to biodiversity based on the mitigation hierarchy;
- Describe the proposed monitoring to ensure that the mitigation measures are implemented and effective.

## 2. Project Overview

The European Bank for Reconstruction and Development (hereafter “EBRD” or the “Bank”) is considering providing finance to the NER (or the “Borrower”), to finance the North Macedonia section of the Greece-North Macedonia Gas Interconnector (the “Project”). EBRD has provisionally determined the Project as Category A. The Project involves the construction of the gas pipeline in the North Macedonian part of the Interconnector North Macedonia (MK)-Greece (GR). This part of the gas pipeline runs in a northern direction of the Mk-Gr border, from municipality of Gevgelija and runs through Bogdanci, Demir Kapija and ends in municipality of Negotino. The Interconnector section of North Macedonia – Greece is 67+193,98 km long with a diameter of Ø 700 (Figure 1).



Figure 1. The Project location

In order to construct the main gas pipeline, first the area needs to be cleared i.e. adequate pipeline right-of-way (ROW) needs to be built along the gas pipeline. Clearing of the area and building the pipeline ROW can be done in several sections simultaneously depending on the accessibility of the area, the regulation of the property and legal relations (Expropriation) and the contractor's capacities (Availability of machinery). In the work area (25 meters, 12.5 m left and right of the axis of the pipe), the access road and staging area for the construction machinery such as trenchers, bulldozers, loaders, and side booms, etc. are located. After the construction, a strip of 7m should be left for maintenance. The route will have eleven water crossings, of which the most sensitive is the river Vardar (8+500).

Possible places for construction camp and storage yards:

- Storage yard Demir Kapija – near 27+000 in bare forest area;
- Storage yard Gevgelija- near 6+800 on an abandoned field near the road;
- Construction camp Demir Kapija -previous place used for construction camp used for construction of highway Demir Kapija-Smokvica by company Actor; and
- Construction camp Gevgelija- near the city centre in urban area.

Access road – existing local roads, forest roads and the one created for the construction of wind park Dren nad Koprishnica (see cumulative impacts for more details).

During the preparation of original ESIA an alternative assessment has been made. Three proposed routes have been assessed based on economical, technical, social and environmental criteria. Consequently, a comparative analysis of the gas pipeline routes alternatives was made in terms of the distance from/penetration in protected areas and proposed protected areas. After conducting the analyses, an adjustment was made of to the route comprised in Alternative 2 and a route was chosen that constitutes the Adopted route. This Adopted Route goes through all the three important bird areas: (IBA) Dolno Povardarie, Tikves and Demir Kapija Canyon, and it fully intersects with the proposed protected area Studena Glava. In the central part of the corridor, the route turns towards south whereby it avoids MN Demir Kapija, IPA Demir Kapija Canyon and the eponymous Emerald Area. Thus, the

impact, primarily on the rare species of birds of prey, as well as on rare and endemic plants, has been minimized in this region.

## 3. Additional Studies taken-Biodiversity Assessment

### 3.1 Introduction

The current chapter elaborates on the results of additional field observations and literature review performed in the period between April and June 2022, on flora, fungi and fauna composition of the proposed pipeline alignment. It contains an authenticated habitat map and lists of species, a depiction of their distribution along with their importance on a local and regional level. The study area covered by our assessment is the general area of the ~68km pipeline corridor between the town of Negotino and the border of Greece, determined based on potentially affected ecosystems. The focus of the biodiversity survey and mapping of habitats is a 1,000-m wide corridor on the central line of the proposed gas pipeline. The said area is deemed appropriate for a survey, and it is sufficiently large to encompass most impacts arising during the construction works and operational needs in the projected area. For species and habitats recognized as PBFs and/or CHs, an ecologically appropriate area of analysis is defined and surveyed.

The purpose of the Biodiversity Survey was to identify whether any species could be affected, which might be considered a priority biodiversity feature' in a national or EU context. Whenever such features had been identified, measures to minimize the project impact upon them were proposed. Biodiversity Assessment was based on a rapid baseline survey of targeted locations along the project area, conducted by specialists with local knowledge. Data collection was conducted via desktop and field research, which ensured a sufficient pool of relevant data and a solid basis concerning the status of the environment and social context covered by the proposed project, as the main prerequisite for identification of the possible impact, and, subsequently, a proposal for a strategy for their mitigation.

### 3.2 Approach and Methodology for Data Collection and Biodiversity Assessment

Linear infrastructure can bring about habitat loss, individual fatalities of wildlife, plus impact upon the populations by fragmentation of wildlife habitats and disruption of animal movement in the area of interest. Therefore, aimed at the completion of the required biodiversity studies, the following assignments for the Greece border - Negotino gas pipeline section have been accomplished:

1. Generating an expanded Habitat Map for all ecosystems and species that are a priority for conservation - Ecologically Appropriate Area of Analysis (EAAA).
2. Conducting spring and summer field research for plants, birds, mammals, herpetofauna, fungi, fish, insects etc.
3. Critical habitat assessment, comprising an identification of priority biodiversity features or critical habitats.
4. Biodiversity impact assessment and mitigation measures.

#### 3.2.1 Data Sources

The following data sources have been used for biodiversity assessment:

- Study on the Status of Biological Diversity of the Republic of Macedonia (MoEPP, 2003);
- Physical Plan of the Republic of Macedonia 2002-2020 (MoEPP, 1999-2004);
- Development of Emerald Network in the Republic of Macedonia (MoEPP, 2002-2004);
- Project: Development of the National Ecological Network in the Republic of Macedonia (MAK-NEN) (MES, ECNC & MoEPP, 2008-2011);
- Important Plant Areas in the Republic of Macedonia (UNDP/GEF & MES, 2011);
- Project: Development of a Representative Protected Areas' Network in the Republic of Macedonia, (UNDP/GEF & MES, 2010);

- Project: Strengthening the Ecological, Institutional and Financial Sustainability of Macedonia's National Protected Areas System (UNDP/GEF & MES, 2011);
- National Strategy for Nature Protection, for the period 2017-2027 (NSPN); and
- Biodiversity Strategy and Action Plan of the Republic of Macedonia (NBSAP) for the period 2018 – 2023.

### **3.2.2 Approach & Methodology**

Biodiversity assessment was conducted in two stages, as follows:

Stage 1: Once a review of relevant literature had been made, including reports and prior environmental assessments on the topic, a visit to scan the area (spring-summer 2022) was made by the project team. In terms of habitats, the following were targeted: forests (oak), pseudomauis, riparian woodlands, meadows, pastures, limestone grounds, rocky grounds, forest clearings, rivers and streams, etc. The surveys for all groups of organisms were executed during spring (April and May) and partially, summertime (June).

Stage 2: Reporting (by end of June 2022).

### **3.2.3 Approach to Assessment Criteria**

The methodology of description and determination of the conservation significance of plant, fungi and animal species is provided below. Data has been obtained from the available literature and via individual examination. The results from the Study on the Status of Biological Diversity of the RNM and the Biodiversity Strategy and Action Plan of the RNM were consulted during data evaluation. Species diversity and conservation importance were assessed in alignment with the conventions and directives ratified by RNM. The documents cited below were consulted during the biodiversity assessment:

#### **Categorization of Flora**

- IUCN Global Red List of Threatened Plants (2020);
- National Red List of Threatened Plants;
- List of Strictly Protected and Protected Wild Species (MOEPP 2011);
- Habitat Directive Annex IIb, Annex IVb;
- CORINE European List;
- IPA – Important Plant Areas; and
- Rare/endemic species.

#### **Categorization of Fungi**

- IUCN Global Red List of Threatened Fungi (2020);
- National Red List of Threatened Fungi;
- List of Strictly Protected and Protected Wild Species (MOEPP 2011);
- Rare species.

#### **Categorization of Fauna**

- IUCN Global Red List of Threatened Species (2020);
- National Red List of Threatened Species (2019);
- European Red List of Freshwater Species compiled by Freyhof and Brooks (2011);
- European Red List of Threatened Species;
- Habitats Directive Annex II, Annex IV and Annex V;
- Bern Convention on the Conservation of European Wildlife and Natural Habitats, Appendix II & III
- CITES Convention - Convention on International Trade in Endangered Species;
- List of Strictly Protected and Protected Wild Species (MOEPP 2011);
- Bonn Convention – Convention of Migratory Species of Wild Animals;
- EU Directive 79/407/ECC on the Conservation of Wild Birds;



- SPEC – Species of European Conservation Concern;
- ETS – European Threat Status;
- Law on Hunting of RM;
- Law on Nature Protection of RM, List of Strictly Protected and Protected Wild Species.

### **Identification of Priority Biodiversity Features and Critical Habitats**

Crucial to this assessment has been the identification of priority biodiversity features and critical habitats, pursuant to Performance Standard 6 of EBRD's Environment and Social Policy. Hence, the following criteria were applied:

#### **for Habitats:**

- EU Habitat Directive – Annex I and Annex I Priority Habitats;
- Bern Convention – Resolution No. 4 (1996); and
- Any core and suitable habitats for species that meet the criteria below.

#### **for Species:**

- National Red List of Threatened Species;
- EU Birds Directive, Annex I and II;
- Birds of Conservation Concern (Red/Amber List);
- Bern Convention on the Conservation of European Wildlife and Natural Habitats, Appendix II & III;
- IUCN Global Red Lists (Vulnerable or beyond that status and Data Deficient);
- IUCN European Red Lists;
- EU Habitats Directive Annex II and Annexes IV and V.

## **3.3 Field Work/ Material Collection and Identification**

**Flora.** Survey of flora and vegetation in the area foreseen for construction of the gas pipeline comprised scanning of the diversity of vascular plants: ferns, gymnosperms and angiosperms. The plants collected during field visits were stored in plastic bags to preserve them fresh for further study whereas those requiring additional laboratory work for identification, were herborized. Plants were identified based on morphological features of all plant parts. The herbarium sheets were labeled, with vital data provided on locality, plant community, altitude, and collection date. The books by Hayek (1927-1931; 1933), Matevski (2010, 2021), Micevski (1985, 1991, 1993, 1998, 2001, 2005), Tutin et al. (1964-1980) were used for identification.

**Habitats and Plant Communities.** Phytological studies were carried out according to the standard vegetation research method of the Zurich-Montpellier School (Braun-Blanquet 1964), whereby homogeneous, representative surfaces, designated as relevés, were selected. Coverage of individual taxa was estimated by an extensively used methodology: + - very rare plant; 1 - covers less than 5% of the selected area; 2- covers between 5 and 25%; 3- covers 25-50%; 4- covers from 50-75%, and with value 5 - covers between 75-100%.

The EAAAs were compiled by using aerial photographs, information gathered from the site visits and data obtained during the survey. The significance of individual habitats was evaluated in conformity with the following:

- Annex I to Council Directive 92/43/EEC dated 21 May 1992, on the Conservation of Natural Habitats and Wild Fauna and Flora;
- Convention on the Conservation of European Wildlife and Natural Habitats. Resolution No. 4 listing endangered natural habitats requiring specific conservation measures, revised Annex 1 (2010).

For species and habitats recognized as PBFs and/or CHs, an ecologically appropriate area of analysis (EAAA) was defined and surveyed.



**Fungi.** The goal of the field survey was to conduct an evaluation of the area from a mycological standpoint by establishing the qualitative-quantitative structure of terricolous and wood-inhabiting fungi in various types of habitats. The survey includes a citation of the unpublished records on species collected in the area up till now, exsiccatae, research notes and data from field research trips organized by the Macedonian Mycological Society (MMS). The survey proceeded in two stages. The field survey phase entailed collection of mycological material aimed at preparing a collection of species growing in the forest associations, and also in clearings and pastures. Research was conducted on different substrates both on deciduous and coniferous tree species. Species determination was done macroscopically during the field survey, and, microscopically, by applying reagents, in the Mycological Laboratory in Skopje. For species identification, standard methods were employed: microscoping, application of reagents (Melzer reagents, Sulphovanilin, Cotton Blau, KOH, etc.), and consulting specialised reference books for fungi identification.

**Amphibians.** No systematic research has been conducted into the class of amphibians; consequently, literature on this taxonomic group is limited. Nevertheless, patchy data on some species were published by Sidorovska 2003, and in the Final Report of the National Red Lists Assessments for Amphibians and Reptiles (Sterijovski & Arsovski 2019), which were both consulted. Field surveys of amphibians mainly took place in the morning when the frequency of day / night activity of this class is usually higher. Samples observed in the field were identified according to the field guides of Radovanović (1951) and Arnold & Owenden (2002). Determination of species presence/distribution was performed by applying the 'Search-and-Seize' Methodology (Vogt 1982). The amphibian and reptile surveys were focused on a 1,000 m wide corridor on the central line of the proposed gas pipeline. This area is considered appropriate for a survey, and it is sufficiently large to encompass most impacts arising during the construction works and operational needs in the projected area. For species and their habitats recognized as PBFs and/or CHs, ecologically appropriate areas of analysis (EAAA) should be defined and surveyed.

**Reptilians.** The publications Contribution to the Knowledge of Reptile Fauna and Diversity in FYR of Macedonia (Sterijovski et al. 2014), and the Final Report of the National Red Lists Assessments for Amphibians and Reptiles (Sterijovski & Arsovski 2019) were the literature analyzed for reptile distribution in the area of interest. Field surveys were chiefly done in the morning when the frequency of day/night activity of these species is habitually higher. Samples observed in the field were determined in accordance with the field guides by Radovanović (1951) and Arnold & Owenden (2002). Identification of species presence / distribution was executed by means of the 'Search-and-Seize' Methodology (Vogt 1982).

**Mammals.** Sign surveys were the principal field research method. It is one of the most broadly used methods for the determination of presence of large mammal species. Transects are searched for footprints, scats, hairs and other signs of passing of large mammal species. When found, all striking signs of presence are documented and stored in a database. Moreover, information on the occurrence of large mammals was assembled by interviewing local hunters, game-wardens, foresters i.e. people with valuable knowledge on wildlife in the affected area.

**Bats.** Survey of bats was performed by an ultrasound bat detector, which detects and records ultrasounds emitted by bats (frequencies ranging between 12 and 120 kHz). The recorded sounds are subsequently analyzed using specialised software. Roost inspection of natural and artificial underground sites in the area was also applied. The inspection involved observation and counting, meaning species identification and assessment of bat population size.

**Birds.** For assessment of bird species occurring at the location of the projected gas pipeline or birds occurring in its vicinity, the following research methodology was implemented: a) desk study analysis of published data on birds in the study area; b) bird surveys in the entire area (contingent on the length and homogeneity of the locations, sample sites representing each identified habitat were selected). These research methods facilitated compiling a comprehensive checklist of bird species and conducting bird assessments in the affected area.

**Invertebrates and aquatic fauna.** The survey on insect diversity focused on the following taxonomic groups: ground beetles (Carabidae); saproxylic beetles (Cerambycidae, Scarabaeidae, Cucujidae, etc.); spiders (Araneae); dragonflies (Odonata); butterflies (Lepidoptera: Rhopalocera). Ground beetles

and spiders followed a similar collection methodology, including hand collection, pitfall trapping and sieving. Dragonflies were detected in both adult and larval forms. Adults were recorded by observation and netting. Larval forms were collected in the streams and ponds. Butterflies were surveyed by field observations and netting in suitable habitats (pastures, meadows, rocky grounds, forest clearings etc).

**Fish.** Surveys of the fish fauna were performed by analysis of literature data, accidental observations where possible (e.g., pools on Kovanska Reka), interviews with fishermen and examination of their catch as well as unpublished results of the surveys conducted in previous years.

### 3.4 Results and Analyses

The study area dealt with in the current assessment is the general area of the ~68km pipeline corridor between the border of Greece and the town of Negotino, defined based on potentially affected ecosystems. The Aol is located in the zone of a typical sub-Mediterranean oak forest. It is a dominant type of vegetation that spreads along the hilly landscape in the higher sections of the gas pipeline corridor. The riparian habitats that follow the water courses are represented by plane-tree and willow zones, with smaller alder forests appearing in certain places. All three types of habitats have been under intense anthropogenic pressure for centuries, due to the occupation of larger areas of arable land. They are in different phases of degradation. The other main types of habitats are represented by various types of grasslands and hilly pastures with sparse shrubs. A significant part of the researched area is modified and/or agriculturally abandoned or otherwise cultivated and/or urbanized.

The planned corridor of the project runs through various complexes of habitats that can be divided into five sections (figure 2):

- First section (Greek border – village of Prdejci): lowland area (46-80m altitude) agricultural arable land, fields and farmlands (KM 0+000 up to KM 16+000)
- Second section (between the villages of Prdejci and Davidovo): hilly area (80-470m altitude) dominated by kermes oak pseudomaquis, plane-tree covered zones appear along the streams (KM 16+000 up to KM 34+500).
- Third section (between the villages of Davidovo and Demir Kapija): hilly area (400-950m altitude) dominated by well-developed oak-hornbeam forest, plane-tree and willow-covered zones appear along the streams (KM 33+500 up to KM 53+000).
- Fourth section, the areas between the villages of Chiflik and Demir Kapija: alder community along the river Bosava (130m altitude), (KM 53+000).
- Fifth section (village of Demir Kapija – town of Negotino): hilly area (130-300m altitude) degraded oak forests, hilly pastures with sparse shrubs and agricultural land (KM 53+000 up to KM 67+140).

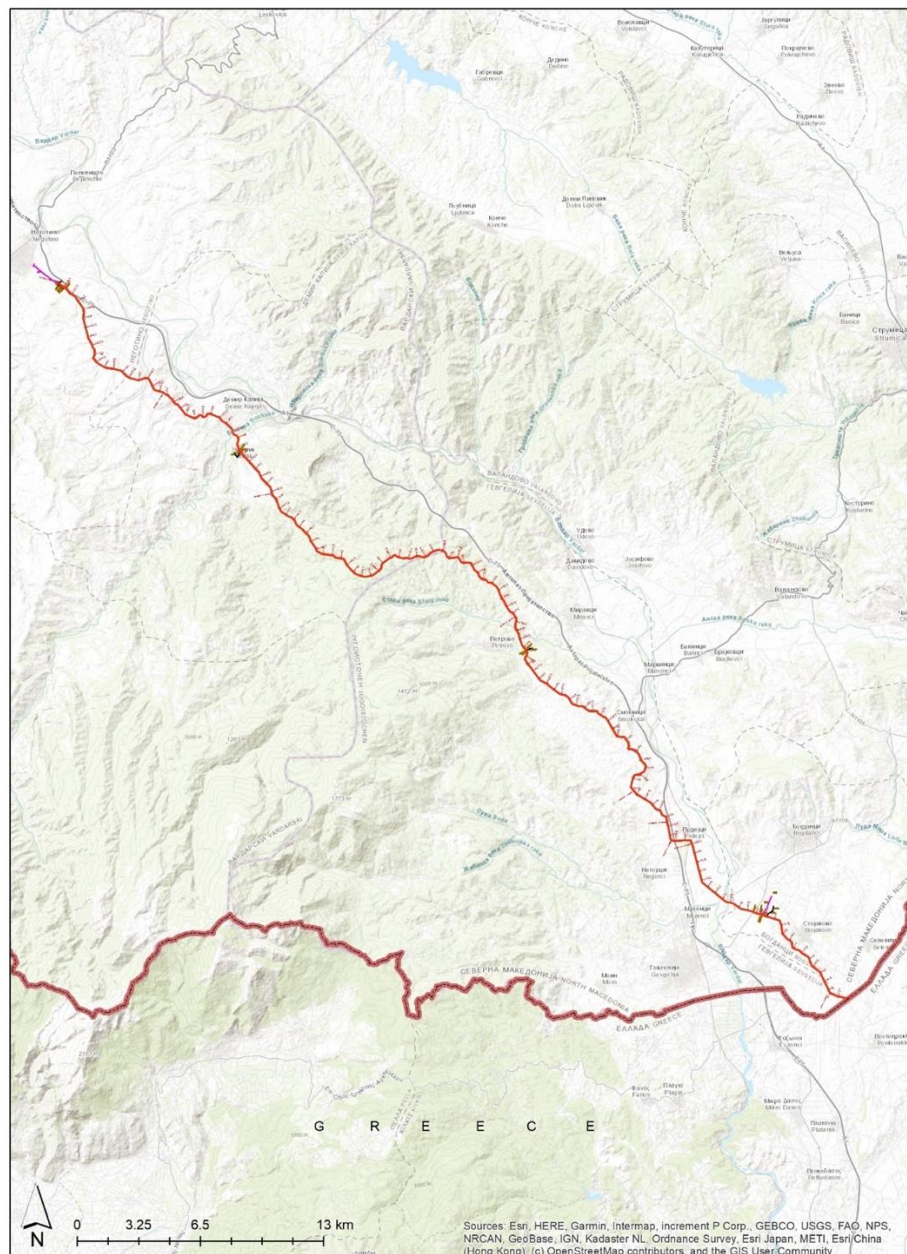


Figure 2. Pipeline alignment divided into 5 sections

### 3.4.1 Habitats

The following presents the summarised results of habitat types mapping, field observations (figure 3), and literature data on the flora and fauna composition of the corridor along the projected gas pipeline. The habitats in the area of the pipeline corridor are divided into two main categories according to their origin: natural and anthropogenic habitats. Natural habitats include forests and scrublands, grasslands, rocky sites and aquatic habitats. Pubescent, kermes oak and oriental hornbeam forest is the prevailing type of vegetation that delineates the features of the hilly forested landscape.





Figure 3. Map of field visit locations (1 to 16)

Eight (8) elementary types of habitats have been identified in the study area. Seven (7) correspond to natural habitats, one (1) to modified habitats. Habitat types with a code under the Habitats Directive classification are those listed in Annex I.

A breakdown of the natural and semi-natural habitats present in the pipeline corridor area is provided in table 1 below:

Table 1. Habitats in the AOI

Habitats	N2000 <sup>1</sup> Code	EUNIS Code <sup>2</sup>
Water courses of plain to montane levels with <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation.	3260	C2.31, C2.22
Constantly flowing mediterranean rivers with Paspalo Agrostidion species and hanging curtains of <i>Salix</i> and <i>Populus alba</i> ).	3280	C3.5
Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea.	*6220	E1.3

<sup>1</sup>[http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index\\_en.htm](http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm) Presence of Habitats Directive Annex 1 habitat types is a prerequisite for consideration of a site for Special Area of Conservation (SAC) designation.

<sup>2</sup><https://eunis.eea.europa.eu/habitats.jsp>

The EUNIS habitat classification is a comprehensive pan-European system for habitat identification.

Habitats	N2000 <sup>1</sup> Code	EUNIS Code <sup>2</sup>
Eastern white oak woods.	*91AA	G1.7372, G1.7C1, G1.762
<i>Salix alba</i> and <i>Populus alba</i> galleries.	92AO	G1.1121
Platanus orientalis and Liquidambar orientalis woods (Platanion orientale).	92C0	G1.3, G1.38, G1.381
Submediterranean pseudomaquis	/	F5.3
Bare tilled, fallow or recently abandoned arable land.	/	I1.5
Arable land.	/	I1.3
Hedgerows.	/	FA
Orchards.	/	G1.D
Pine plantations.	/	G3.F12
Broadleaved deciduous forestry plantations.	/	G1.C, G1.C3
Industrial, commercial and other man-made structures.	/	J3.2, J1.4, J4.2

- Description of habitats from the field surveys**

**HABITAT 1. WATER COURSES OF PLAIN TO MONTANE LEVELS WITH RANUNCULION FLUITANTIS AND CALLITRICHIO - BATRACHION VEGETATION**



Figure 4. Macrophytic vegetation in the lower course of the river Vardar

The habitat comprises a plethora of aquatic plant communities. It refers to watercourses or streams with a slow or medium-fast flow. The habitat incorporates mesotrophic to eutrophic waters, which often hold plenty of organic matter derived or brought from the upper parts of watercourses (figure 4). This type of habitat comprises parts of rivers and streams with a flowing water speed normally below 1 m/s. The

following is data on the surveyed sites, communities, and a list of registered plant species.

Point T 15

Location Bogdanci: Gjavato vill., along the river Vardar, riparian vegetation.

Coordinates 41,17082689 N; 22,5306534 E;

Altitude 40 m

Plant species

*Butomus umbellatus*

*Phragmites australis*

*Myriophyllum verticillatum*

*Roripa sp.*

**HABITAT 2: 3280 CONSTANTLY FLOWING MEDITERRANEAN RIVERS WITH PASPALO AGROSTIDION SPECIES AND HANGING CURTAINS OF SALIX AND POPULUS ALBA**



Figure 5. Dried riverbed of the Sermeninska River

(EUNIS Habitat Classification: C3.5 Periodically inundated shores with pioneer and ephemeral vegetation)

The 3280 habitat develops between the aquatic vegetation and riverine forest belt, and the habitat growth is conditioned by periodical floods. In its physiognomy, it comprises two belts; right next to the bank, there are associations with a floristic composition dominated by annual and ruderal plants 10-40 cm tall, whose vegetation cover ranges from 50 to 80% (seldom 100%), and the surface where they develop is sometimes limited to 10-20m<sup>2</sup>. The vegetation has a late and fast growth in late summer, and it disappears during autumn months with deluging of the habitat (figure 5).

The habitat is significant for aquatic and wetland organisms, as a pollutant purifier and for control of riverbank erosion. The major threats posed to the current habitat are as follows: urbanization, industrial and related activities; use of biocides, hormones and chemicals; pollution of surface waters; roads, motorways, sports and recreational activities in the open; invasive allochthonous species, soil pollution and solid waste.

The following contains data on the surveyed sites, communities and a list of registered plant species.

Point T 14

Location Gevgelija: Mrzenci vill.- the Sermeninska River, in the riverbed and along the river.

Coordinates 41,17098483 N; 22,50816028 E;

Altitude 49 m

Plant species

+ *Cleome aurea*



**Point T 14**

**+ *Euphorbia graeca***

**+ *Bupleurum rotundifolium***

***Arundo donax***

**HABITAT 3: 6220\* PSEUDO-STEPPE WITH GRASSES AND ANNUALS OF THE THERO-BRACHYPODIETEA**

This habitat type contains hill pastures developing on siliceous substrate and dominated by annual plants. The pastures represent pioneering, initial phases in succession, distinguished by minor production of biomass formed by small, ephemeral annuals.



Figure 6. Dry grassland near Stojakovo

They have a short life cycle (less than a year); specifically, their growth normally begins during autumn or winter period with seed germination, followed by rapid growth during springtime when they commence to flower and rapidly produce seeds by late spring or early summer (figure 6). After seed dispersal, the plants immediately die out whereas their fruits and seeds hibernate in the soil until the onset of autumn rains that prompt their germination i.e. conception of the new generation. The quantity of biomass yielded largely depends on the precipitation in early spring. The abundant precipitation during the wet season contributes to a larger production of biomass but if drought prevails during springtime, the vegetation remains are virtually invisible. The habitat, which usually

occupies small areas, is mostly distributed in a mosaic with other communities, commonly scrub or plant communities from the adjacent vegetation types. It occurs in clear and open areas among shrubs or other higher annuals. In the Mediterranean region, the scrubland or grassland landscape is a result of long-term anthropogenic influence. The annual grasslands are considered an initial succession stage, substituting the primary vegetation of mainly oak forests in regions where there are ongoing degradation processes triggered by various human activities, fires etc.

Regardless of the low volume of biomass, this habitat type may reach a high number of species in its composition, particularly in the Mediterranean and Sub-Mediterranean regions (the territory of N. Macedonia inclusive).

In addition, these grasslands can be a substantial resource for sheep grazing during summertime when the latter usually exploit shrubs. These grasslands are not very useful per se but they significantly raise the value of the areas during springtime, in the period of sheep breeding, since the grasslands meet the momentary, additional energy and protein needs of sheep. This is also the case with the territory of N. Macedonia where districts comprising the current habitat type are used as winter pastures (Negotino region, Gevgelija region etc)

**EUNIS:** E1. An Open Mediterranean dry acid and neutral grassland. E1.33 East Mediterranean xeric grassland.

HD Annex 1: 6220\* Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea.

EuroVegChecklist: *Helianthemetea guttati* Rivas Goday et Rivas-Mart. 1963. *Helianthemetalia guttati* Br.-Bl. in Br.-Bl. et al. 1940. *Trifolion cherleri* Micevski 1972 (Balkans). ass. *Petrorrhagio-Trisetetummyrianthi* Micevski 1972 ass. *Biserrulo-Scleranthetum dichotomae* Matevski et Kostadinovski 1998.

This habitat type occurs in most of the sub-Mediterranean countries, accompanied by the moderate zones of Europe, North Africa, and the Middle East where the siliceous geological substrate is found in extensive areas. In N. Macedonia, the communities of the current habitat type develop in a large portion of its territory but first and foremost in the central, southern and south-western regions, which are profoundly influenced by the modified sub-Mediterranean climate (in pseudo-steppes, the regions of Gevgelija, Dojran, Strumica, Mariovo, Pelagonija).

In the Aol, plant communities of the current habitat occur in Gevgelija (Bogorodica v., Negorci, Sermenin, Novo Konjsko, Gjavato v., Stojakovo v.). Along the surveyed area (figure 7-11), the habitat was recorded at five (T3, T8, T10, T11 and T16) locations. The table contains data on the surveyed sites, communities, and a list of registered plant species.

Point	T3	T8	T10	T 11	T 16
<b>Location</b>	Demir Kapija: hilly pasture	Gevgelija: Miravci, hilly pasture of silicate	Gevgelija: Smokvica v., hilly pastures of silicate in the belt of Quercus coccifera	Demir Kapija: between the village of Przhdevo and the village of Besvica, a hilly pasture of marl.	Bogdanci: Stojakovo v., hilly pasture, of silicate, abandoned fields in succession.
<b>Coordinates</b>	41,39668183N; 22,23778112 E;	41,30402032N; 22,39924903E;	41,25542634N; 22,46671788E;	41,40969887N; 22,14134619E;	41,14634064N; 22,57509385E;
<b>Altitude</b>	182 m.	225 m	141 m.	289 m	70 m
<b>Plant</b>	<i>Xeranthemum annuum</i>	<i>Medicago minima</i> 2	+ <i>Biserrula pelecinus</i>	<i>Astragalus parnassi</i>	<i>Onobrychis pindicola</i>
<b>Species</b>	<i>Orlaya daucorlaya</i>	<i>Psilurus incurvus</i> 2	<i>Trifolium cherleri</i>	<i>Ferulago macedonica</i>	<i>Erysimum campestre</i>
	<i>Anthemis tinctorial</i>	<i>Onobrychis aequidentata</i>	<i>Trifolium angustifolium</i>	<i>Teucrium capitatum</i>	<i>Trifolium purpureum</i>
	<i>Eryngium campestre</i>	<i>Silene graeca</i>	<i>Aegilops triaristata</i>	<i>Eryngium campestre</i>	<i>Avena fatua</i>
	<i>Althaea cannabina</i>	<i>Herniaria incana</i> 1	<i>Teucrium capitatum</i>	<i>Achillea coarctata</i>	<i>Achillea coarctata</i>
	<i>Trifolium scabrum</i>	<i>Velezia rigida</i>	<i>Onobrychis aequidentata</i>	<i>Helianthemum salicifolium</i>	<i>Rumex</i>
	<i>Trifolium hirtum</i>	<i>Avena fatua</i>	<i>Psilurus incurvus</i>	<i>Avena fatua</i>	<i>Cynosurus echinatus</i>
	<i>Nigella damascena</i>	<i>Haplophylum</i>	<i>Trifolium purpureum</i>	<i>Thymus pseudoatticus</i>	<i>Hypochaeris cretensis</i>
	<i>Agropyron repens</i>	<i>Crupina vulgaris</i>	<i>Ornithopus compressus</i>	<i>Aegilops triaristata</i>	<i>Tragopogon majus</i>



Point	T3	T8	T10	T 11	T 16
	<i>Aegilops ovata</i>	<i>Anthemis tinctoria</i>		<i>Scabiosa ucranica</i>	<i>Daucus carota</i>
	<i>Dasypyrum villosum</i>	<i>Campanula ligulate</i>		<i>Sanguisorba minor</i>	<i>Hypericum perforatum</i>
	<i>Trifolium campestre</i>	<i>Biserrula pelecinus</i>		<i>Knautia degenii</i>	<i>Chondrilla juncea</i>
	<i>Crupina vulgaris</i>	<i>Trifolium angustifolium</i>		<i>Onobrychis hypargyrea</i>	<i>Aegilops triaristata</i>
	<i>Carthamus lanatus</i>	<i>Stachys thymphaea</i>		<i>Psilurus incurvus</i>	<i>Paliurus spina - christi</i>
	<i>Teucrium capitatum</i>	<i>Centaurea grisebachii</i>		<i>Silene conica</i>	<i>Petrorhagia prolifera</i>
	<i>Medicago minima</i>	<i>Sanguisorba minor</i>		<i>Haplophyllum biebersteinii</i>	<i>Vicia villosa</i>
	<i>Stachys tymphaea</i>	<i>Thymus thracicus</i>		<i>Hippocrepis ciliata</i>	<i>Marrubium peregrinum</i>
	<i>Psoralea bituminosa</i>	<i>Filago minima</i>		<i>Trifolium purpureum</i>	<i>Thymus sibthorpii</i>
	<i>Paliurus spina-christi</i>	<i>Verbascum</i>		<i>Haynaldia villosa</i>	+ <i>Euphorbia</i>
	<i>Convolvulus cantabrica</i>	<i>Hypericum rumeliacum</i>		<i>Chondrilla juncea</i>	
	<i>Quercus coccifera</i>	<i>Vulpia myuros</i>		<i>Crupina vulgaris</i>	
	<i>Quercus pubescens</i>	<i>Carthamus lanatus</i>		<i>Euphorbia myrsinites</i>	
	<i>Rubus canescens</i>	<i>Phleum phleoides</i>		<i>Linum liburnicum</i>	
	<i>Allium sphaerocephalon</i>	<i>Convolvulus cantabrica</i>		<i>Salvia aethiopis</i>	
	<i>Brachypodium distachyon</i>			<i>Astragalus onobrychis</i>	
	<i>Pistacia terebinthus</i>			<i>Centaurea finazzi</i>	
	+ <i>Tolpis umbellata</i>			<i>Valerianella coronata</i>	
	+ <i>Carex</i>			<i>Cynosurus echinatus</i>	

Point	T3	T8	T10	T 11	T 16
	<i>Comandra elegans</i>			<i>Hypericum rumeliacum</i>	
	<i>Dactylis glomerate</i>			<i>Onobrychis pindicola</i>	
	<i>Vicia peregrina</i>			<i>Anthemis tinctoria</i>	
	<i>Centaurea gr. Grisebachii</i>			<i>Psoralea bituminosa</i>	
	<i>Rumex sp.</i>			<i>Marrubium peregrinum</i>	
				<i>Onosma heterophylla</i>	
				<i>Paliurus spina-christi</i>	
				<i>Xeranthemum annuum</i>	



Figure 7. T3 - Dry grassland near Demir Kapija.



Figure 8. T8 - Dry grassland near Miravci v.



Figure 9. T10 - Ass. *Bisserulo-Scleranthetum dichotomae* near Smokvica v.



Figure 10. T11 - Dry grassland near Przdeva v.

#### **HABITAT 4: \*91AA EASTERN WHITE OAK WOODS**

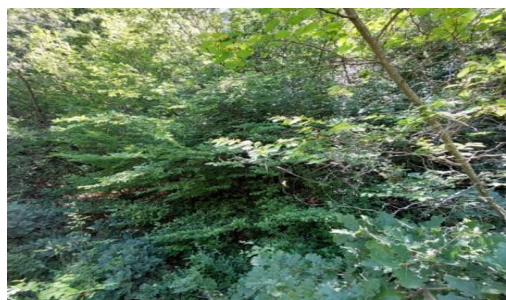


Figure 11. White oak-oriental hornbeam woods above Dren

Habitat 91AA: eastern white-oak woods have a priority status according to COUNCIL DIRECTIVE 92/43/EEC. 'Azonal white oak' communities with sub-Mediterranean flora, occupying thermophilous oases in the sub-continental zones of the alliances *Quercion frainetto* and *Carpinion Illyricum*.

Pubescent oak (*Quercus pubescens*) occurs as a dominant edificatory species in xerothermic oak forests on calcareous ground that are part of the remaining mixed oak forests (figure 11). From vegetation perspective, these forests normally join the climate-zonal association of *Querco-Carpinetum orientalis* Rudski apud Ht., usually

reaching up to 600 m of altitude. They are mostly fragmented, low-height forests (reaching 4-8 m in height), with copious species composition.

On certain sites, the association ascends to 1,300 m of altitude, penetrating the areal of the climate-zonal association of *Quercetum frainetto-cerris*, where the association's edificatory species are not able to survive. Commonly these are steep, warm slopes, on limestone, regularly on shallow, skeletal soil. These azonal xerophilous forests are regarded as potential natural vegetation in these habitats. In Macedonia, the vegetation is typified by the association *Querco pubescentis-Ostryetum carpinifoliae* Horvat 1938 (for Bistra and Galicica mountains, Rizovski and Dzekov also cite *Seslerio-Ostryetum carpinifoliae* Ht et H-ć 1950). Besides *Quercus pubescens*, a co-dominant species in these forests is the oriental hornbeam (*Carpinus orientalis*) whereas the species *Acer monspessulanum*, *Fraxinus ornus* and others may also be found in the tree layer.

#### **EUNIS:**

- G1.7 Thermophilous deciduous woodland.
- G1.73: Eastern *Quercus pubescens* woods.
- G1.733: Hellenic *Quercus pubescens* woods.
- G1.76: Balkano-Anatolian thermophilous *Quercus* forests.
- G1.761: Helleno-Moesian *Quercus cerris* forests.
- G1.762: Helleno-Moesian *Quercus frainetto* forests.
- G1.764: Helleno-Moesian montane oak forests.

The current habitat is likely the most widespread habitat type in N. Macedonia, extending to three climate-zonal areas, occupying a height belt of circa 100-1,100 m (Filipovski et al., 1996). Most of the habitat is situated in the valleys of the long rivers – the Vardar (the Vardar valley from Skopje valley to Demir Kapija), the Crna reka r. (Tikves, part of Mariovo), the Bregalnica, the Strumica river, the valleys in the middle course of the Treska r., the lowest parts in the region of the rivers Crn Drim and Radika, and the valleys from 400-900 m of altitude (Polog, Kicevo, Debar, Struga, Ohrid, Prespa, Pelagonija, Kriva Palanka, Delcevo, Kratovo). An insubstantial portion of the habitat is distinguished by mountain relief, found in all mountains in N. Macedonia, in the belt from 900 to 1,100 m of altitude.

In the Aol, this habitat was recorded at one location. The following contains data on the surveyed sites, communities, and a list of registered plant species.

Point	T4
Location	Demir Kapija: above Dren village, forest of <i>Quercus pubescens</i> and <i>Carpinus orientalis</i> , silicate.
Comm.	ass. <i>Querco-Carpinetum orientalis</i> Horv. 1954.
Coordinates	41,36452467 N; 22,25094963 E;
Altitude	260 m.
Plant species	
	<i>Quercus pubescens</i> 3
	<i>Carpinus orientalis</i> 3
	<i>Juniperus communis</i>
	<i>Cornus sanguinea</i>
	<i>Paliurus spina-christi</i>
	<i>Chamaecytissus</i> sp.
	<i>Carex pendula</i>
	<i>Poa trivialis</i>
	<i>Acer</i> sp.
	<i>Aristolochia pallida</i>
	<i>Fragaria vesca</i>
	<i>Agrimonia eupatoria</i>
	<i>Cruciata laevipes</i>
	<i>Cardamine graeca</i>
	<i>Phillyrea latifolia</i> +
	<i>Quercus coccifera</i> +
	<i>Melica uniflora</i>



Point T4

*Dactylis glomerate*

*Tamus communis*

*Rosa arvensis*

*Clematis vitalba*

*Prunus mahaleb*

#### **HABITAT 5: 23F5 SHRUBS AND LOW WOODS OF KERMES OAK (QUERCUS COCCIFERA).**

In a sizable portion of the researched area, there is a plant community with dominant participation of *Quercus coccifera*. The habitat encompasses evergreen, hard-leaved shrubs and low woods (pseudomaquis) dominated by *Quercus coccifera* that belong to the Mediterranean vegetation type. *Quercus coccifera* is a typical evergreen tree or shrub with hard, leathery, spiny leaves. The communities (figure12-15) have a scrub outlook –most of the trees do not exceed 4 m, and they primarily originate from shoots. In small patches, the trees can reach 8–10 m in height, and they can be with a diameter of 30–40 cm. Together with the edificator, often some tree species of Mediterranean or sub-Mediterranean type also occur, such as *Carpinus orientalis*, *Celtis australis*, *Fraxinus ornus*, *Ostrya carpinifolia*, *Pistacia terebinthus*, *Pyrus amygdaliformis*, *Quercus pubescens*.

Along the surveyed area, the habitat was recorded at four (T5, T7, T9 and T12) locations. The table contains data on the surveyed sites, communities, and a list of registered plant species.

Point	T5	T7	T9	T 12
<b>Location</b>	Demir Kapija: above Dren village, in the <i>Quercus coccifera</i> belt, silicate.	Gevgelija: Miravci, in the forest belt of <i>Quercus coccifera</i> , silicate.	Gevgelija: Smokvica v., in the <i>Quercus coccifera</i> belt, silicate.	Gevgelija: between the villages of Smokvica and Prdejci, in the forest belt of <i>Quercus coccifera</i> .
<b>Comm.</b>	Querco cocciferae-Carpinetum			
<b>Coordinates</b>	41,36487209 N; 22,25223281 E;	41,30383798 N; 22,39935482 E;	41,25417488 N; 22, 46686572 E;	41,23107365 N; 22,48599373 E;
<b>Altitude</b>	281 m	221 m.	140 m	73 m
<b>Plant species</b>	<i>Quercus coccifera</i> 3	<i>Quercus coccifera</i> 3	<i>Quercus coccifera</i>	<i>Quercus coccifera</i> 3
	<i>Juniperus communis</i> 3	<i>Quercus pubescens</i> 1	<i>Juniperus communis</i>	<i>Quercus pubescens</i> +
	<i>Genista tinctoria</i> +	<i>Coronilla emeris</i> subsp. <i>emeris</i>	<i>Asparagus acutifolius</i>	<i>Phillyrea latifolia</i> 2
	<i>Quercus pubescens</i> 1	<i>Fraxinus ornus</i> 1	<i>Carpinus orientalis</i>	<i>Asparagus acutifolius</i>
	<i>Carpinus orientalis</i> 3	<i>Carpinus orientalis</i> 3	<i>Pyrus amygdaliformis</i>	<i>Ruscus aculeatus</i> 2

Point	T5	T7	T9	T 12
	<i>Phyllirea latifolia</i> 1	<i>Juniperus communis</i>	<i>Clematis</i>	<i>Fraxinus ornus</i> 2
	+ <i>Allysum</i> sp. - жолм у со плод	<i>Comandra elegans</i>	<i>Pistacia terebinthus</i>	<i>Coronilla emeris</i> subsp. <i>emeroides</i>
	<i>Crucianella latifolia</i> +	<i>Ruscus aculeatus</i>	<i>Fraxinus ornus</i>	<i>Paliurus spina-christi</i>
	<i>Fraxinus ornus</i> +	<i>Asparagus acutifolius</i>	<i>Clematis vitalba</i>	<i>Jasminum fruticans</i>
	<i>Pistacia terebinthus</i> +	<i>Phillyrea latifolia</i>	<i>Phyllirea latifolia</i>	<i>Pistacia terebinthus</i>
	<i>Colutea arborescens</i> +	<i>Trifolium speciosum</i>	<i>Cotinus coggygria</i>	<i>Rubus sanguineus</i>
	<i>Medicago minima</i> +	<i>Thymus thracicus</i>	<i>Ruscus aculeatus</i>	<i>Rosa arvensis</i>
	<i>Rhamnus rhodopea</i> +	<i>Dactylis glomerata</i>	<i>Coronilla emeris</i> subsp. <i>emeroides</i>	<i>Carpinus orientalis</i> 1
	<i>Asparagus acutifolius</i> +	<i>Arenaria leptoclados</i>	<i>Dactylis glomerata</i>	<i>Clematis flammula</i>
	<i>Paliurus spina-christi</i> +	<i>Galium aparine</i>	<i>Thymus thracicus</i>	<i>Dactylis glomerata</i>
	<i>Medicago falcata</i>	<i>Silene italica</i>	<i>Trifolium hirtum</i>	<i>Trifolium speciosum</i>
	<i>Euphorbia myrsinites</i>	<i>Asplenium adiantum-nigrum</i>	<i>Trifolium angustifolium</i>	<i>Cerastium glomeratum</i>
	<i>Lycopsis arvensis</i>		<i>Dorycnium hirsutum</i>	<i>Teucrium chamaedrys</i>
	<i>Crepis</i> sp.		<i>Lonicera caprifolium</i>	<i>Trifolium angustifolium</i>
	<i>Orlaya daucoides</i>		<i>Aegilops triaristata</i>	<i>Vicia angustifolia</i>
	<i>Geranium pusillum</i>		<i>Trifolium speciosum</i>	<i>Sambucus ebulus</i>
	<i>Stipa capillaris</i>		<i>Verbascum</i> sp.	<i>Fragaria vesca</i>
	<i>Aegilops triaristata</i>		+ <i>Silene graeca</i>	+ <i>Dianthus cruentus</i>
	<i>Scutellaria columnae</i>		+ <i>Melilotus neapolitanus</i>	<i>Lithospermum purpureocoeruleum</i>
	<i>Cardamine craeca</i>			<i>Trifolium scabrum</i>
	<i>Dactylis glomerata</i>			<i>Chondrilla juncea</i>
	+ <i>Erysimum</i>			<i>Vicia grandiflora</i>
	<i>Eryngium campestre</i>			



Figure 12. T5- Kermes oak-oriental hornbeam forest above Dren v.



Figure 13. T7 - Kermes oak-oriental hornbeam forest near Miravci v.



Figure 14. T9 - Kermes oak-oriental hornbeam forest above Smokvica v.

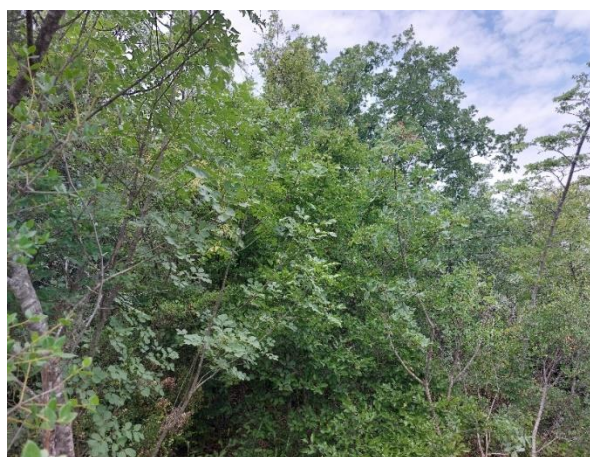


Figure 15. T12 - Kermes oak-oriental hornbeam forest between the villages of Smokvica and Prdejci,

#### **HABITAT 6: 92A0 SALIX ALBA AND POPULUS ALBA GALLERIES**

The habitat is typified by riparian forests along the lowland watercourses of greater rivers and their tributaries. Forests are shaped as narrow, long or short, continuous or intermittent lines of trees. The willow stands are directly in contact with the watercourse while poplars form a narrow belt farther from the riverbed, on alluvial terraces, where water remains close to the surface even during summertime (figure 16).



Figure 16. Willow-poplar riparian forest vegetation, near Gjavato v., along the river Vardar.

Despite the habitat's minor width, its communities are normally distinguished by their distinct forest layers. The primary edificatory species are the following: *Populus alba*, *P. nigra*, *Salix alba*, *S. fragilis*; sporadically, *Alnus glutinosa*, *Ulmus minor* and *Platanus orientalis* may also emerge. In the lower layers of shrubs and grasses, pioneer species are common as well as numerous alochtonous species (especially along the rivers Vardar and Bregalnica).

Lianas are typical, which exhibit rather high species diversity here (*Calystegia sepium*, *Clematis vitalba*, *C. viticella*, *Humulus lupulus*, *Hedera helix*,



*Periploca graeca*, *Rubus* ssp., *Vitis sylvestris*). The habitat of riparian galleries fulfils an array of functions, and its role is pivotal. Namely, it acts as a buffer protecting the water surface from contamination; it mitigates erosion processes of the river banks; by providing a shade, it reduces the fluctuation of water temperature; it diminishes water eutrophication by filtration of sediments and nutrients; it is a habitat for plenty of aquatic and riparian organisms. Hence, disruption of the current vegetation type has severe effects on the hydro-morphological and biological features of river courses: riverbanks stability weakens, water quality lessens, and biodiversity is reduced. The table contains data on the surveyed sites, communities, and a list of registered plant species.

Point	T 15
Location	Bogdanci: Gjavato vill., along the river Vardar, riparian vegetation
Comm.	ass. <i>Salicetum albae – fragilis</i>
Coordinates	41,17082689 N; 22,5306534 E;
Altitude	40 m
Plant species	<i>Salix alba</i> 4
	<i>Amorpha fruticosa</i> 2
	<i>Galium aparine</i>
	<i>Conium maculatum</i>
	<i>Ulmus laevis</i>
	<i>Acer negundo</i>
	<i>Platanus orientalis</i> +
	<i>Solanum dulcamara</i>
	<i>Dactylis glomerata</i>
	<i>Artemisia vulgaris</i>
	<i>Lycopus europaeus</i>
	<i>Chenopodium polyspermum</i>
	<i>Silybum marianum</i>
	<i>Humulus lupulus</i>
	<i>Rubus sanguineus</i>
	<i>Vitis sylvestris</i>
	<i>Populus alba</i> +
	<i>Bryonia alba</i>
	<i>Arctium lappa</i>

#### **HABITAT 7: 92C0 PLATANUS ORIENTALIS AND LIQUIDAMBAR ORIENTALIS WOODS (PLATANION ORIENTALE)**

Forests and wooded lands, mostly riparian, dominated by *Platanus orientalis* (oriental plane) or *Liquidambar orientalis*, belonging to the alliance *Platanion orientalis* [The Interpretation Manual of European Union Habitats (EU Commission 2013)]

In N. Macedonia, the forests of *Platanus orientalis* occur i.e. the sub-habitat 44.711- Helleno-Balkan riparian plane forests. Gallery forests of *Platanus orientalis* grow along water courses, intermittent rivers and ravines in Greece and the southern Balkans.

In N. Macedonia, the habitat is limited to its southern and south-eastern parts, where the impact of sub-Mediterranean climate is most distinct. The best stands are found in the ravines of the river Vardar and its southern tributaries, and in the basin of the Strumica river. These forests have gallery nature, and their width is most often relatively small. Phytocoenologically, they are affiliated to the association *Juglando-Platanetum* Em 1962.



**EUNIS:** G1.3: Mediterranean riparian woodland. G1.38: *Platanus orientalis* woods. G1.381: Helleno-Balkan riparian plane forests.

**HD Annex 1:** 92C0: *Platanus orientalis* and *Liquidambar orientalis* woods (*Platanion orientalis*).

**EuroVeg Checklist:** *Platanion orientalis*. ass. Juglando-Platanetum Em 1962.

Along the surveyed area, the habitat was recorded at four (T2, T6, T13 and T14) locations (figure 17-20). The table contains data on the surveyed sites, communities, and a list of registered plant species.

Point	T2	T6	T 13	T 14
<b>Location</b>	Demir Kapija: near the Aqua Park, along the r. Boshava.	Gevgelija: Miravci, in the forest belt of <i>Platanus orientalis</i> near the Stara Reka river.	Gevgelija: Prdejci v., along the Kovanska River, a degraded forest of <i>Platanus orientalis</i>	Gevgelija: Mrzenci v. – the Sermeninska River, in the riverbed and along the river.
<b>Community</b>	Alnetum with <i>Platanus</i>	ass. Juglando-Platanetum Em 1962		
<b>Coordinates</b>	41,398031 N; 22,221276 E;	41,30408733 N; 22,39699461 E;	41,21182117 N; 22,49323276 E;	41,17115654 N; 22,51044377 E;
<b>Altitude</b>	128m	223 m	69m.	52 m
<b>Plant species</b>	<i>Alnus glutinosa</i> 3	<i>Platanus orientalis</i> 4	<i>Platanus orientalis</i>	<i>Platanus orientalis</i>
	<i>Platanus orientalis</i> 2	<i>Alnus glutinosa</i> 2	<i>Tamarix</i>	<i>Tamarix</i> sp.
	<i>Allium</i> sp.	<i>Coronilla emerus</i> subsp. <i>Emeroides</i>	+ <i>Veronica anagallis-aquatica</i>	<i>Ailanthus glandulosa</i>
	<i>Euphorbia amygdaloides</i> 2	<i>Carex pendula</i>	<i>Lysimachia atropurpurea</i>	<i>Clematis vitalba</i>
	<i>Rubus caesius</i>	<i>Galum album</i>	+ <i>Cleome (fa)</i> nov. loc.	<i>Salix alba</i>
	<i>Dactylis glomerata</i>	<i>Equisetum arvense</i>	<i>Nasturtium officinale</i>	<i>Salix</i> cf. <i>eleagnos</i>
	<i>Robinia pseudoacacia</i>	<i>Periploca graeca</i>	<i>Achillea coarctata</i>	<i>Populus nigra</i>
	<i>Juglans regia</i>	<i>Petasites albus</i>	<i>Salix elaeagnifolia</i>	<i>Haynaldia villosa</i>
	<i>Periploca graeca</i>	<i>Carpinus orientalis</i>	<i>Papaver rhoeas</i>	<i>Alliaria officinalis</i>
	<i>Carex brizoides</i>	<i>Fraxinus ornus</i>	<i>Mentha spicata</i>	<i>Hypericum perforatum</i>
	<i>Scutellaria columnae</i>	<i>Bidens tripartitus</i>	<i>Brachypodium pinnatum</i>	<i>Bromus sterilis</i>
	<i>Prunus spinosa</i>	<i>Rubus caesius</i>	<i>Rubus sanguineus</i>	<i>Euphorbia</i> sp.
	<i>Cornus sanguinea</i>	<i>Scutellaria columnae</i>	<i>Populus nigra</i>	<i>Cardamine graeca</i>

<i>Galium aparine</i>	<i>Clematis vitalba</i>	<i>Silene vulgaris</i>	<i>Euphorbia amygdaloides</i>
<i>Chelidonium majus</i>	<i>Ruscus aculeatus</i>	+ <i>Vaccaria</i>	<i>Petrorhagia prolifera</i>
<i>Parietaria officinalis</i>	<i>Rubus sanguineus</i>	<i>Bidens tripartite</i>	<i>Psilurus incurvus</i>
<i>Clematis vitalba</i>	<i>Hedera helix</i>	<i>Clematis vitalba</i>	<i>Euphorbia cyparissias</i>
<i>Aristolochia clematitis</i>	<i>Sambucus nigra</i>	<i>Rumex acetosella</i>	<i>Echium italicum</i>
<i>Populus nigra</i>	<i>Dactylis glomerata</i>	<i>Cychorium intybus</i>	<i>Chondrilla juncea</i>
<i>Ailanthus glandulosa</i>	<i>Lactuca muralis</i>		
<i>Calystegia sepium</i>	<i>Brachypodium sylvaticum</i>		
<i>Ranunculus repens</i>	<i>Cardamine graeca</i>		
<i>Taraxacum officinale</i>	<i>Alliaria officinalis</i>		
<i>Urtica dioica</i>	<i>Geranium robertianum</i>		
<i>Equisetum arvense</i>	<i>Tamus communis</i>		
	<i>Carex hirta</i>		
	<i>Carex cf. stellulata</i>		
	<i>Euphorbia amygdaloides</i>		
	+ <i>Astragalus glycyphyllos</i>		
	+ <i>Crepis</i>		
	<i>Juniperus communis</i>		
	<i>Arabis tenella</i>		
	<i>Clematis vitalba</i>		
	<i>Asparagus acutifolius</i>		
	<i>Stipa capillata</i>		

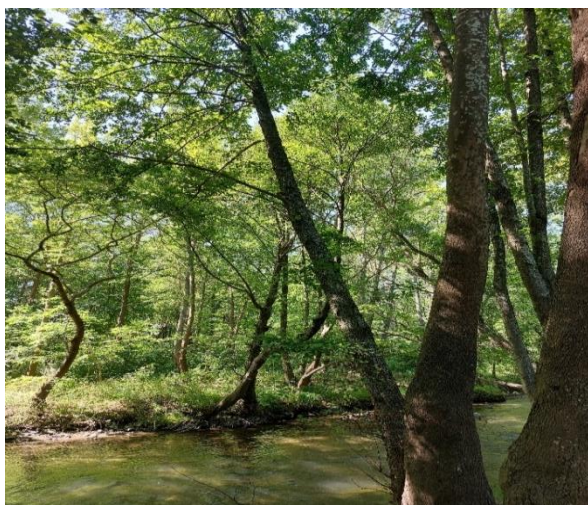


Figure 17. T2 - Oriental plane forest along the r. Bosava.

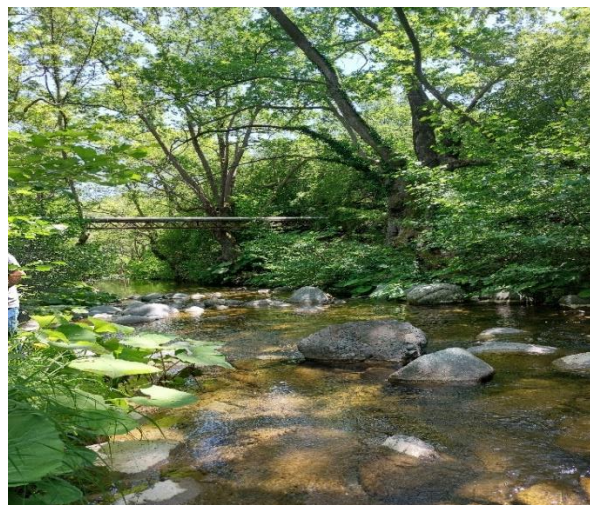


Figure 18. T6 - Oriental plane forest near Miravci v., along the Stara Reka r.



Figure 19. T13 - Oriental plane forest along the Kovanska River, near Prdejci v.



Figure 20. T14 - Oriental plane forest along the Sermeninska River near Mrzenci v.

#### **HABITAT 8- BARE TILLED, FALLOW OR RECENTLY ABANDONED ARABLE LAND**



Figure 21. Ruderal vegetation with *Silybum marianum* in the vicinity of Negotino.

Fields abandoned or left to rest, and other interstitial spaces on disturbed ground. Set-aside or abandoned arable land with forbs planted for purposes of soil protection, stabilization, fertilisation or reclamation. Abandoned fields are colonised by numerous pioneering, introduced or nitrophilous plants. They sometimes provide habitats that can be used by animals of open spaces. There were numerous areas of this type of habitat in the area of interest (figure 21). At the visited location T1, ass. *Geranio-Silybetum mariani* Oberd. 1954 was the prevailing community.

The following contains data on the surveyed sites, communities, and a list of registered plant species.

Point	T1
<b>Location</b>	Negotino: at the second overpass of the motorway in the direction of Demir Kapija.
<b>Comm.</b>	Ruderal vegetation with <i>Silybum marianum</i> ass. <i>Silybetum mariani</i>
<b>Coordinates</b>	41,47196499 N; 22,11987699 E;
<b>Altitude</b>	175 m.
<b>Plant species</b>	<i>Silybum marianum</i> 4 <i>Papaver rhoeas</i> 1 <i>Malabaila aurea</i> <i>Avena fatua</i> <i>Bromus tectorum</i> <i>Cichorium intybus</i> <i>Convolvulus arvensis</i> <i>Daucus carota</i> + <i>Trifolium echinatum</i> <i>Erigeron annuus</i> + <i>Crepis</i> sp. <i>Chondrilla juncea</i> <i>Rumex pulcher</i> <i>Salvia aethiopsis</i> + <i>Vicia sativa</i> <i>Veronica</i> sp. <i>Geranium dissectum</i> <i>Arenaria leptoclados</i> <i>Cerastium glomeratum</i> <i>Consolida orientalis</i> <i>Sonchus oleraceus</i> <i>Cirsium arvense</i>



Point	T1
	<i>Medicago minima</i>
	<i>Silene otitis</i>
	<i>Hypericum perforatum</i>

This section of the corridor passes through a heterogeneous terrain where a number of varied habitats interchange, which stimulates the occurrence of plentiful and diverse plant life. Trifolion cherlerialliance covers sizable areas. From vegetation point of view, in the silicate pastures, *Tunico-Trisetetum myrianthi* are the overriding associations, which was predictable.

The association *Tunico-Trisetetum myrianthi* is found in the southernmost parts of the Republic of North Macedonia, which are exposed to the influence of the Mediterranean (Micevski, 1972). It has also been observed at a number of localities in northern Greece. In the vicinity of Gevgelija, it develops in the zone of *Quercus coccifera*, from 100-300 meters above sea level; it occurs as the last stage of forest degradation. It develops on silicate and non-carbonate soils, deep or eroded, covered with smaller or coarser rocks. The pastures where this association develops are exposed to intensive grazing and trampling, which gives them a specific appearance. Therophyte species prevail while geophytes and hamephites are less numerous.; they occur above 100-1,000 m of altitude.

The most important characteristic species of the association are as follows: *Petrorhagia velutina*, *Trisetum myrianthum*, *Trifolium glomeratum*, *Plantago bellardi*, *Ornithopus compressus*, *Valerianella microcarpa* and *Trifolium suffocatum*.

On the territory of N. Macedonia, the association *Tunico-Trisetetum myrianthi* is differentiated into two sub-associations. In the area of interest, subass. *trifolietosum stellati* Micevski 1972 occurs. It is worth emphasizing that during our research, the ass. *Biserrulo-Scleranthetum dichotomae* Matevski et Kostadinovski 1998 was recorded in this area for the first time. This association has so far been known only from the area of Mariovo, from the gorge of the Crna river, in the vicinity of Rasim Bej Most, from Cebren to Skocivir v. The habitats where the aforesaid community develops are extreme degradation stages of the ass. *Quercus-Carpinetum orientalis*, whereof single stems may be spotted, which act as stabilizers of the habitats, thus preventing total erosion. The communities include an array of Mediterranean and sub-Mediterranean species. Characteristic species of the association are the following: *Scleranthus perennis* subsp. *dichotomus*, *Biserula pelecinus* and others.

While composing the wording concerning the habitats in the area, certain problems arose in the classification of the pseudomaquis shrubs of kermes oak that occupy huge areas in the Lower Povardarie. An appropriate code in the Natura 2000 Habitat Interpreter could not be found that would match our pseudomaquis. Therefore, we sorted it in compliance with the EUNIS classification. The appearance of pseudomaquis shrubs of oak and white hornbeam in the Lower Povardarie is associated with the impact of the altered Mediterranean climate, which is characterized by higher temperatures, aridity, mild winter without snow, but with humid conditions and mild winter temperatures. It develops on all geological substrates present in the area. These ecological conditions are favourable for development of kermes oak, which is an evergreen species adapted to the orographic conditions that prevail in the field. The most common species are the following: *Quercus coccifera*, *Quercus pubescens*, *Carpinus orientalis*, *Fraxinus ornus*, *Phillyrea media*, *Pistacia terebinthus*, *Coronilla emeroides*, *Colueta arborescens*, *Crataegus heldreichii*, *Lonicera etrusca*, *Cornus mas*, *Paliurus spina christi*, *Jasminum fruticans*, *Ruscus aculeatus* and others. The most common environment for the plane tree is the new deposits of sand and gravel along the river banks. Often these are places where the river meanders, i.e. it occurs along river bends (arches) where the impact of running water is enormous, and in the spring months they are flooded. Nonetheless, it is not unusual to sight plane trees on the cones of rivers. In the tree floor, in addition to the dominant plane tree, alder (*Alnus*

*glutinosa*), white willow (*Salix alba*), walnut (*Junglas regia*), black ash (*Fraxinus ornus*) and others are also found.

The plain sections of the corridor, both near Negotino and in the surroundings of Demir Kapija, are mostly occupied by agricultural land.

As regards invasive species, the false acacia (*Robinia pseudoacacia*), and the indigo bush (*Amorpha fruticosa*) were observed along the pipeline corridor.

- **Habitat Mapping Results of the Study Area**

The following table presents the surface area of habitats in a ca. 1-km-wide strip, centred on the pipeline project axis. This buffer includes a 25-metre-wide strip, centred on the pipeline axis. A total of **75.85 ha** of natural habitats will be impacted. Habitat map is given on figure 22 (see Annex 1).

Table 2. List of habitats

Habitats	1 km-wide strip - Area (ha)	25 m-wide strip - Area (ha)
<b>Natural habitats</b>	<b>3,034</b>	<b>75.85</b>
N2K:3260 Water courses of plain to montane levels with Ranunculion fluitantis and Callitricho-Batrachion vegetation.	11	0.275
N2K: 3280 Constantly flowing mediterranean rivers with Paspalo Agrostidion species and hanging curtains of Salix and Populus alba).		
N2K:*6220 Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea.	196	4.9
N2K:*91AA Eastern white oak woods.	3	0.075
N2K: 23F5 Shrubs and low woods of Kermes Oak ( <i>Quercus coccifera</i> )	2,761	69.025
N2K:92AO Salix alba and Populus alba galleries.	12	0.3
N2K:92C0 Platanus orientalis and Liquidambar orientalis woods (Platanion orientale).	51	1.275
<b>Modified habitats</b>	<b>3,599</b>	<b>89.975</b>
EUNIS:I1.5 Bare tilled, fallow or recently abandoned arable land.	559	13.975
EUNIS:G3.F1 Native conifer plantations.	240	6
EUNIS:G5.1,FA Lines of trees; Hedgerows.	309	7.725
EUNIS:I1 Arable land and market gardens.	2,340	58.5
EUNIS:J Constructed, industrial and other artificial habitats.	151	3.775
<b>Grand Total</b>	<b>6,633</b>	<b>165.825</b>

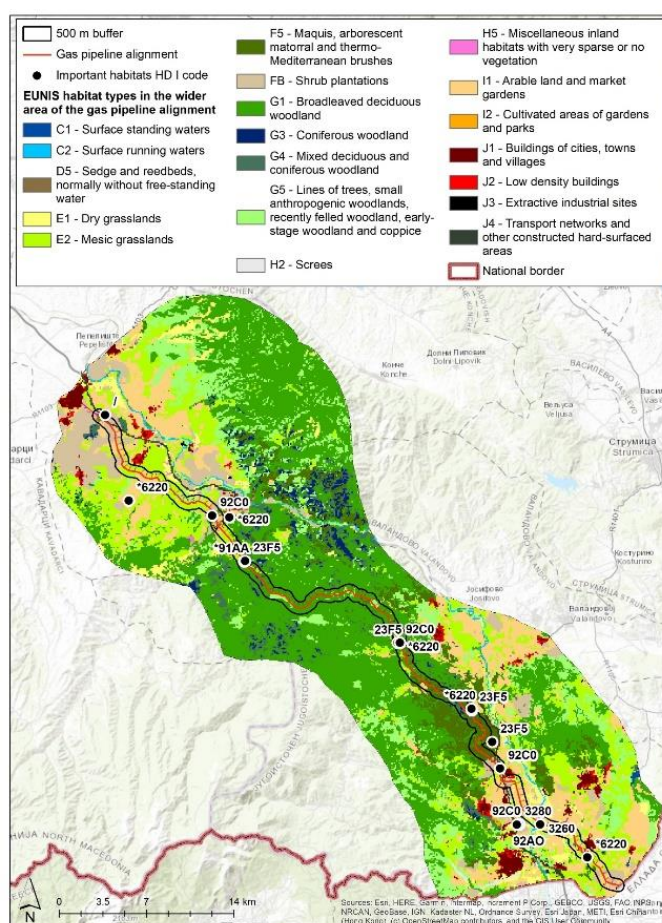


Figure 22. Habitat map

### 3.4.2 Species

#### • Flora

##### Methodology

Field research was conducted at chosen locations along the pipeline corridor aimed at surveying diverse habitats and establishing the occurrence of important species. The studied sites and the lists of species are provided below.

##### Results of Field Study

The data on the diversity of plant species along the gas pipeline corridor are a result of the field research conducted within the framework of this project, in the period between April and June 2022. In total, 210 plant species were recorded. The association of the plant species within different habitats is presented in the description of habitats. One of the most striking features of the flora is the presence of Mediterranean and Submediterranean species which are characteristic for thermophilous habitats: *Onobrychis hypargyrea*, *Astragalus parnassi*, *Centaurea finazzeri*, *Centaurea grisebachii*, *Comandra elegans*, *Haplophyllum biebersteinii*, *Marrubium peregrinum*, *Periploca graeca*, *Phyllirea latifolia*, *Pistacia terebinthus*, *Platanus orientalis*, etc.

None of the plant species is protected by national or international legislation. There are no species on the National red list (<http://redlist.moepp.gov.mk/>) or on the National List of Strictly Protected and Protected Wild Species. Also, none of the species has important threat status on the global or European red lists of species. None of the species is listed in the annexes or appendices of the EU Habitats Directive or Bern Convention. Only three species (*Onobrychis pindicola*, *Centaurea finazzeri*

and *Centaurea grisebachii*) may be considered as Balkan endemics since all of them are distributed in the south Balkan countries (Greece, Albania, North Macedonia, Bulgaria).



Figure 23: *Centaurea finazzeri* (Photo by S. Hristovski)

Table 3. List of plant species in the area

Plant species	Comment
<i>Acer negundo</i>	Allochthonous and invasive species in the riparian vegetation along rivers
<i>Achillea coarctata</i>	/
<i>Aegilops ovata</i>	/
<i>Aegilops triaristata</i>	/
<i>Agropyron repens</i>	/
<i>Ailanthus glandulosa</i>	Allochthonous and invasive species, widespread in North Macedonia, mostly in ruderal and agricultural habitats
<i>Alliaria officinalis</i>	/
<i>Allium</i> sp.	/
<i>Allium sphaerocephalon</i>	/
<i>Alnus glutinosa</i>	/
<i>Althaea cannabina</i>	/
<i>Amorpha fruticosa</i>	Allochthonous and invasive species, widespread along large rivers in North Macedonia
<i>Anthemis tinctoria</i>	/
<i>Arabis tenella</i>	/
<i>Arctium lappa</i>	/
<i>Arenaria leptoclados</i>	/
<i>Aristolochia clematitis</i>	/



Plant species	Comment
<i>Artemisia vulgaris</i>	/
<i>Arundo donax</i>	Allocthonous species with potential for invasiveness.
<i>Asparagus acutifolius</i>	/
<i>Asplenium adiantum-nigrum</i>	/
<i>Astragalus glycyphyllos</i>	/
<i>Astragalus onobrychis</i>	/
<i>Astragalus parnassi</i>	/
<i>Avena fatua</i>	/
<i>Bidens tripartita</i>	/
<i>Biserrula pelecinus</i>	/
<i>Brachypodium distachyon</i>	/
<i>Brachypodium pinnatum</i>	/
<i>Brachypodium sylvaticum</i>	/
<i>Bromus sterilis</i>	/
<i>Bromus tectorum</i>	/
<i>Bryonia alba</i>	/
<i>Calystegia sepium</i>	/
<i>Campanula ligulata</i>	/
<i>Cardamine craeca</i>	/
<i>Carex brizoides</i>	/
<i>Carex cf. stellulata</i>	/
<i>Carex hirta</i>	/
<i>Carex pendula</i>	/
<i>Carpinus orientalis</i>	/
<i>Carthamus lanatus</i>	/
<i>Centaurea finazzeri</i>	Species with south Balkan distribution (Greece, Albania, North Macedonia, Bulgaria)
<i>Centaurea grisebachii</i>	Species with south Balkan distribution (Greece, Albania, North Macedonia)
<i>Cerastium glomeratum</i>	/
<i>Chelidonium majus</i>	/
<i>Chenopodium polyspermum</i>	/
<i>Chondrilla juncea</i>	/

Plant species	Comment
<i>Cichorium intybus</i>	/
<i>Cirsium arvense</i>	/
<i>Clematis flammula</i>	/
<i>Clematis vitalba</i>	/
<i>Cleome (fa) nov. loc.</i>	/
<i>Colutea arborescens</i>	/
<i>Comandra elegans</i>	/
<i>Conium maculatum</i>	/
<i>Consolida orientalis</i>	/
<i>Convolvulus arvensis</i>	/
<i>Convolvulus cantabrica</i>	/
<i>Cornus sanguinea</i>	/
<i>Coronilla emerus subsp. emeroides</i>	/
<i>Coronilla emerus subsp. emerus</i>	/
<i>Cotinus coggygria</i>	/
<i>Crepis sp.</i>	/
<i>Crucianella latifolia</i>	/
<i>Crupina vulgaris</i>	/
<i>Cychorium intybus</i>	/
<i>Cynosurus echinatus</i>	/
<i>Dactylis glomerata</i>	/
<i>Dasypyrum villosum</i>	/
<i>Daucus carota</i>	/
<i>Dianthus cruentus</i>	/
<i>Dorycnium hirsutum</i>	/
<i>Echium italicum</i>	/
<i>Equisetum arvense</i>	/
<i>Erigeron annuus</i>	North American species introduced in Europe.
<i>Eryngium campestre</i>	/
<i>Erysimum sp.</i>	/
<i>Euphorbia sp.</i>	/

Plant species	Comment
<i>Euphorbia amygdaloides</i>	/
<i>Euphorbia cyparissias</i>	/
<i>Euphorbia myrsinites</i>	/
<i>Ferulago macedonica</i>	/
<i>Filago minima</i>	/
<i>Fragaria vesca</i>	/
<i>Fraxinus ornus</i>	/
<i>Galium aparine</i>	/
<i>Galum album</i>	/
<i>Genista tinctoria</i>	/
<i>Geranium dissectum</i>	/
<i>Geranium pusillum</i>	/
<i>Geranium robertianum</i>	/
<i>Haplophyllum biebersteinii</i>	/
<i>Haplophyllum</i> sp.	/
<i>Haynaldia villosa</i>	/
<i>Helianthemum salicifolium</i>	/
<i>Herera helix</i>	/
<i>Herniaria incana</i>	/
<i>Hippocrepis ciliata</i>	/
<i>Humulus lupulus</i>	/
<i>Hypericum perforatum</i>	Well known medicinal plant (St. John's Worth)
<i>Hypericum rumeliacum</i>	/
<i>Hypochaeris cretensis</i>	/
<i>Jasminum fruticans</i>	/
<i>Juglans regia</i>	/
<i>Juniperus communis</i>	/
<i>Knautia degenii</i>	/
<i>Lactuca muralis</i>	/
<i>Linum liburnicum</i>	/
<i>Lithospermum purpureocoeruleum</i>	/

Plant species	Comment
<i>Lonicera caprifolium</i>	/
<i>Lycopsis arvensis</i>	/
<i>Lycopus europaeus</i>	/
<i>Lysimachia atropurpurea</i>	/
<i>Malabaila aurea</i>	/
<i>Marrubium peregrinum</i>	/
<i>Medicago falcata</i>	/
<i>Medicago minima</i>	/
<i>Melilotus neapolitanus</i>	/
<i>Mentha spicata</i>	/
<i>Nasturtium officinale</i>	/
<i>Nigella damascena</i>	/
<i>Onobrychis aequidentata</i>	/
<i>Onobrychis hypargyrea</i>	/
<i>Onobrychis pindicola</i>	/
<i>Onosma heterophylla</i>	/
<i>Orlaya daucoides</i>	/
<i>Orlaya daucorlaya</i>	/
<i>Ornithopus compressus</i>	/
<i>Paliurus spina-christi</i>	/
<i>Papaver rhoeas</i>	/
<i>Parietaria officinalis</i>	/
<i>Periploca graeca</i>	/
<i>Petasites albus</i>	/
<i>Petrorhagia prolifera</i>	/
<i>Phleum phleoides</i>	/
<i>Phyllirea latifolia</i>	/
<i>Pistacia terebinthus</i>	/
<i>Platanus orientalis</i>	/
<i>Populus alba</i>	/
<i>Populus nigra</i>	/

Plant species	Comment
<i>Prunus spinosa</i>	/
<i>Psilurus incurvus</i>	/
<i>Psoralea bituminosa</i>	/
<i>Pyrus amygdaliformis</i>	/
<i>Quercus coccifera</i>	/
<i>Quercus pubescens</i>	/
<i>Ranunculus repens</i>	/
<i>Rhamnus rhodopea</i>	/
<i>Robinia pseudoacacia</i>	Allocthonous and invasive species, widespread in North Macedonia; used for erosion prevention/control and planted in natural forest communities
<i>Rosa arvensis</i>	/
<i>Rubus caesius</i>	/
<i>Rubus canescens</i>	/
<i>Rubus sanguineus</i>	/
<i>Rumex acetosella</i>	/
<i>Rumex pulcher</i>	/
<i>Rumex sp.</i>	/
<i>Ruscus aculeatus</i>	/
<i>Salix alba</i>	/
<i>Salix eleagnos</i>	/
<i>Salvia aethiopis</i>	/
<i>Sambucus ebulus</i>	/
<i>Sambucus nigra</i>	/
<i>Sanguisorba minor</i>	/
<i>Scabiosa ucranica</i>	/
<i>Scutellaria columnae</i>	/
<i>Silene conica</i>	/
<i>Silene graeca</i>	/
<i>Silene italica</i>	/
<i>Silene otites</i>	/
<i>Silene vulgaris</i>	/
<i>Silybum marianum</i>	/



Plant species	Comment
<i>Solanum dulcamara</i>	/
<i>Sonchus oleraceus</i>	/
<i>Stachys tymphaea</i>	/
<i>Stipa capillaris</i>	/
<i>Tamarix</i> sp.	/
<i>Tamus communis</i>	/
<i>Taraxacum officinale</i>	/
<i>Teucrium capitatum</i>	/
<i>Teucrium chamaedrys</i>	/
<i>Thymus pseudoatticus</i>	/
<i>Thymus sibthorpii</i>	/
<i>Thymus thracicus</i>	/
<i>Tolpis umbellata</i>	/
<i>Tragopogon majus</i>	/
<i>Trifolium angustifolium</i>	/
<i>Trifolium campestre</i>	/
<i>Trifolium cherleri</i>	/
<i>Trifolium echinatum</i>	/
<i>Trifolium hirtum</i>	/
<i>Trifolium purpureum</i>	/
<i>Trifolium scabrum</i>	/
<i>Trifolium speciosum</i>	/
<i>Ulmus laevis</i>	/
<i>Urtica dioica</i>	/
<i>Vaccaria</i> sp.	/
<i>Valerianella coronata</i>	/
<i>Velezia rigida</i>	/
<i>Verbascum</i> sp.	/
<i>Veronica anagallis-aquatica</i>	/
<i>Veronica</i> sp.	/
<i>Vicia angustifolia</i>	/

Plant species	Comment
<i>Vicia grandiflora</i>	/
<i>Vicia sativa</i>	/
<i>Vicia villosa</i>	/
<i>Vicia peregrina</i>	/
<i>Vitis sylvestris</i>	/
<i>Vulpia myuros</i>	/
<i>Xeranthemum annuum</i>	/

## • Fungi

### Introduction

The data on fungi diversity along the gas pipeline corridor are a result of the field research conducted within the framework of this project, in the period between April and June 2022. The current report also comprises the approximately fifty fungal species identified during the screening performed in autumn 2020. Hence, coupled with the spring species from this year, an inclusive list of fungi in the area of interest has been compiled. The majority of the species are lignicolous, collected from oak forest and from the riparian vegetation, while a lesser part of them are terricolous. Literature data on the area mainly refer to commercial species foraged by the local population.

The research within the present project has yielded new data on a number of species, supplemented by the National Collection of Fungi (Macedonian Collection of Fungi, MCF) and the database of fungi (MACFUNGI). Some of these data will be used to add to the National Red List of Fungi, the Biodiversity Strategy of the Republic of Macedonia, and other important documents.

### Methodology

The objective of the field study is to conduct evaluation of the area from a mycological perspective by establishing the qualitative - quantitative structure of terricolous and wood-inhabiting fungi in various types of habitats. The study includes citation of the unpublished records on species collected in the area thus far, exsiccatae, research notes, and data from field research trips organised by the Macedonian Mycological Society (MMS).

The research was conducted in two stages as follows: first, field research activities in the studied area, aimed at collection of mycological material; second, laboratory analyses of the material collected. The first phase entailed collection of mycological material in order to prepare a collection of species growing in the forest associations, and also in clearings and pastures. Research was conducted on different substrates, both on deciduous and coniferous tree species. Species determination was performed macroscopically during the field study, and, microscopically, by applying reagents, in the Mycological Laboratory in Skopje.

For species identification, standard methods were employed, implying microscoping, application of reagents (Melzer reagents, Sulphovanilin, Cotton blau, KOH, etc.), and consulting specialised reference books for identification of the collected fungi.

### Results of Field Study

As a result of the research, **116 fungal taxa** were identified. The highest number of species - 89, belongs to the phylum Basidiomycota, which is represented by 39 families whereof most of the species are affiliated with the following families: Marasmiaceae, Mycenaceae, Polyporaceae, Agaricaceae and Tricholomataceae. The phylum Ascomycota comprises 24 species, and three species were identified from the phylum Myxomycota. The majority of the species are lignicolous, collected from deciduous

forest (primarily oak) and from the riparian vegetation while a minor part are terricolous. Literature data associated with the area is chiefly concerned with commercial species foraged by the local population.

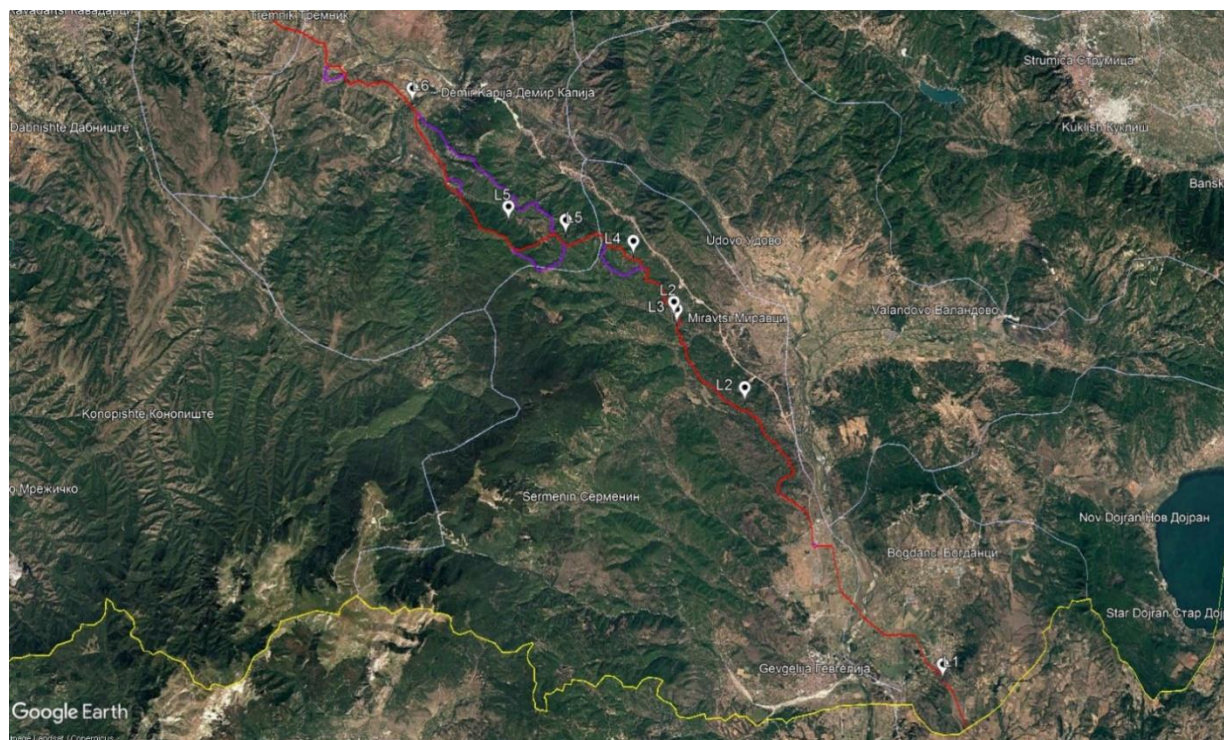


Figure 24. Map of field visit locations (1 to 6).

L1. Selemli village. (41.142912° 22.580221°)

Habitat: 6220 Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea.

Alt.: 130 m.

Species	Abundance (number of genets)
<i>Agaricus campestris</i>	10+
<i>Calocybe gambosa</i>	5
<i>Bovista plumbea</i>	20+
<i>Pleurotus eryngii</i>	5
<i>Marasmius oreades</i>	20+

L2. Pseudomaquis - shrublands with kermes oak and hornbeam— close to Petrovo village, (41.305735°; 22.398563°) & Smokvica village (41.267606°; 22.446032°).

Habitat: \*91AA Eastern white oak woods (EUNIS: F5.31 Helleno-Balkan pseudomaquis)

Alt.: 200-350 m

Species	Abundance (number of genets)
<i>Amanita caesarea</i>	10+
<i>Antrodia albida</i>	5
<i>Boletus reticulatus</i>	7
<i>Lopharia spadicea</i>	3
<i>Meruliopsis hirtellus</i>	1
<i>Peniophora incarnata</i>	3
<i>Peniophora meridionalis</i>	4
<i>Stereum hirsutum</i>	20+
<i>Terana caerulea</i>	1
<i>Vuilleminia megalospora</i>	20+

L3. Plane belt along the Stara Reka stream, near Petrovo village (41.302295°; 22.400702°).

Habitats: 92C0 *Platanus orientalis* and *Liquidambar orientalis* woods (Platanion orientalis).

Alt.: ≈ 230 m.

Species	Abundance (number of genets)
<i>Coprinus comatus</i>	3
<i>Fomes fomentarius</i>	1
<i>Auricularia mesenterica</i>	5
<i>Panus tigrinus</i>	3
<i>Stereum hirsutum</i>	10

L4. Downy oak and hornbeam forests – *Quercus-Carpinetum orientalis* (41.332809°; 22.370957°).

Habitat: \*91AA Eastern white oak woods (EUNIS: G1.737 Eastern sub-Mediterranean white oak).

Alt.: 450-500 m.

Species	Abundance (number of genets)
<i>Amanita caesarea</i>	10+
<i>Boletus aereus</i>	4
<i>Boletus reticulatus</i>	6
<i>Cantharellus cibarius</i>	10
<i>Daedalea quercina</i>	1

Species	Abundance (number of genets)
<i>Dichomitus campestris</i>	2
<i>Exidia truncate</i>	2
<i>Hapalopilus nidulans</i>	1
<i>Hyphodontia crustose</i>	3
<i>Peniophora quercina</i>	5
<i>Phellinus punctatus</i>	2
<i>Radulomyces molaris</i>	3
<i>Steccherinum ochraceum</i>	3
<i>Stereum hirsutum</i>	20+
<i>Trametes versicolor</i>	10+
<i>Vuilleminia comedens</i>	20+

L5. Foot of Kozhuf Mt. (41.340527°; 22.328152° & 41.344431°; 22.294614°)

Habitat: \*91AA Eastern white oak woods (Ass. Quercetum frainetto-cerris Rud.).

Alt.: 550-650 m.

Species	Abundance (number of genets)
<i>Agaricus sylvaticus</i>	2
<i>Amanita caesarea</i>	5
<i>Boletus aereus</i>	7
<i>Boletus reticulatus</i>	12
<i>Cantharellus cibarius</i>	7
<i>Craterellus cornucopioides</i>	1
<i>Hydnum repandum</i>	3
<i>Lycoperdon perlatum</i>	10

L6. The Bosava river, in the vicinity of Demir Kapija (41.398672°; 22.226684°).

Habitat: \*91EO Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae).

Alt.: 120 m.



Species	Abundance (number of genets)
<i>Phellinus igniarius</i>	3
<i>Panus tigrinus</i>	1
<i>Auricularia mesenterica</i>	5
<i>Xylodon sambuci</i>	5
<i>Byssomerulius corium</i>	4

### Valorisation

Valorisation of fungi was executed consistent with the national and international conventions, and the legislation on protection of threatened species on a European or global level, as follows: Global and National Red List of Threatened Fungi, National List of Strictly Protected and Protected Wild Species, as well as the rare species occurring in the area.

Table 4. Valorisation of fungi in the pipeline corridor area

Species	National Red List of Fungi (2021)	IUCN Red List of Threatened Fungi (2020-'21)	List of Strictly Protected and Protected Wild Species (MOEPP 2011)	Rare Species	Edible Species	Commercial Species	Habitats (EU HD)
<i>Agaricus arvensis</i>		LC			*		Agricultural land
<i>Agaricus campestris</i>		LC			*		6540, 6210
<i>Agaricus sylvaticus</i>		LC			*		91AA
<i>Amanita caesarea</i>	LC	LC	Protected		*	*	91AA, Pseudomaquis
<i>Boletus aereus</i>			Protected		*	*	91AA, Pseudomaquis
<i>Boletus reticulatus</i>		LC			*	*	91AA, Pseudomaquis
<i>Calocybe gambosa</i>		LC			*	*	6540, 6210
<i>Cantharellus cibarius</i>					*	*	91AA
<i>Coprinus comatus</i>		LC			*		6540
<i>Craterellus cornucopioides</i>			Protected		*	*	91AA
<i>Byssomerulius hirtellus</i>				*			Pseudomaquis
<i>Morchella esculenta</i>					*	*	91AA, 92CO
<i>Morchella conica</i>					*	*	Pine plantations
<i>Flammulina velutipes</i>		LC			*		92CO, urbanised area
<i>Hydnum repandum</i>		LC			*		91AA
<i>Lactarius deliciosus</i>					*	*	Pine plantations
<i>Lycoperdon perlatum</i>		LC					91AA
<i>Macrolepiota procera</i>			Protected		*		6540
<i>Marasmius oreades</i>					*	*	6540, 6210

Species	National Red List of Fungi (2021)	IUCN Red List of Threatened Fungi (2020-'21)	List of Strictly Protected and Protected Wild Species (MOEPP 2011)	Rare Species	Edible Species	Commercial Species	Habitats (EU HD)
<i>Pleurotus eryngii</i>					*		6540
<i>Russula vesca</i>		LC			*		91AA
<i>Suillus granulatus</i>		LC			*	*	Pine plantations
<i>Suillus luteus</i>		LC			*		Pine plantations

## Discussion

For the aims of the current project, species valorisation was carried out on the basis of the best studied macromycetes representatives. Twenty-three species were evaluated, whereof 21 belong to the club fungi taxonomically while the remaining two species belong to the sac fungi. The commercial species Caesar's mushroom (*Amanita caesarea*) is categorised as 'least concern' (LC) in the National Red List of Fungi of North Macedonia (2021). Four species are listed as protected consistent with the List of Strictly Protected and Protected Wild Species (MoEPP, 2011). Thirteen species are on the Global Red List of Threatened Species, all of them in the category of 'least concern' (LC).

Eleven of the evaluated species are commercial and foraged by the local population. Pertaining to the species that can be consumed by humans, the most noteworthy are the following: the champignons (*Agaricus campestris*, *A. sylvaticus* and *A. arvensis*), then the boletes (*Boletus aereus* and *B. reticulatus*), the Caesar's mushroom (*Amanita caesarea*), the species St. George's mushroom (*Calocybe gambosa*), the shaggy ink cap (*Coprinus comatus*), the parasol mushroom (*Macrolepiota procera*), the black trumpet (*Craterellus cornucopioides*), the fairy ring mushroom (*Marasmius oreades*), the true morels (*Morchella esculenta* and *Morchella conica*), and the granulated bolete (*Suillus granulatus*). The species *Amanita pantherina* and *A. phalloides* are lethal.

The species *Agaricus campestris*, *Calocybe gambosa*, *Marasmius oreades* and *Pleurotus eryngii* are well-known meadow species, and they are common in the project area. The majority of the species prefer oak forests whereas the species *Suillus granulatus*, *Suillus luteus*, *Lactarius deliciosus* and *Morchella conica* are distinctive of pine plantations. The commercial species *Morchella esculenta* commonly inhabits riparian forest associations. It is only *Byssomerulius hirtellus* of the rare species that was found, occurring as a saprobe on dry fallen branches of scarlet oak. Except for the latter species, there are not any data on other rare fungi species in the project area.

Nevertheless, in the past the area was scarcely studied from a mycological aspect, and the available data largely refer to common, widespread and commercial species.

## Description of Important Species

***Amanita caesarea*** (figure 25). The Caesar's mushroom is an ectomycorrhizal species, mainly with oak and seldom with beech, sweet-chestnut and hornbeam. The species usually produces sporocarps from mid-spring to mid-autumn, and it is frequently noticed during warm and rainy seasons. It has been

found at many sites in the country, broadly dispersed in 50 biogeographic regions. The population trend is stable since the species occurs at the edges of forests, in open, sunny coppice woodlands that are abundant in the country. It is assessed as least concerned in the National Red List of Fungi (2021)<sup>3</sup>. It is an edible, highly appreciated species. It is collected by mushroom foragers but it is rarely traded by mushroom purveyors. In the affected area, the species is common and it was sighted at many places, in the oak community and in the pseudomaquis.

***Byssomerulius hirtellus*** (figure 26). The species *Byssomerulius hirtellus* is a corticioid fungal species known from the pseudomaquis zone in the south-eastern part of the country. It most often develops as a saprobe on fallen branches of scarlet oak. It is a thermophilous species with Mediterranean distribution in Europe, predominantly in Spain, Italy and France. In the affected area, the species (two fruit bodies) was sighted only at a single location, on a fallen branch of scarlet oak in the pseudomaquis, in close proximity of Smokvica village, at an altitude of 120 metres (41.252564°; 22.470187°).

Location of important fungal species is given on figure 28.



Figure 25. Caesar's mushroom (*Amanita caesarea*) – a common commercial species assessed as LC in the National Red List of Fungi (photo by M. Karadelev).



Figure 26. *Byssomerulius hirtellus* – Mediterranean species appearing in pseudomaquis areas as a saprobe on scarlet oak.

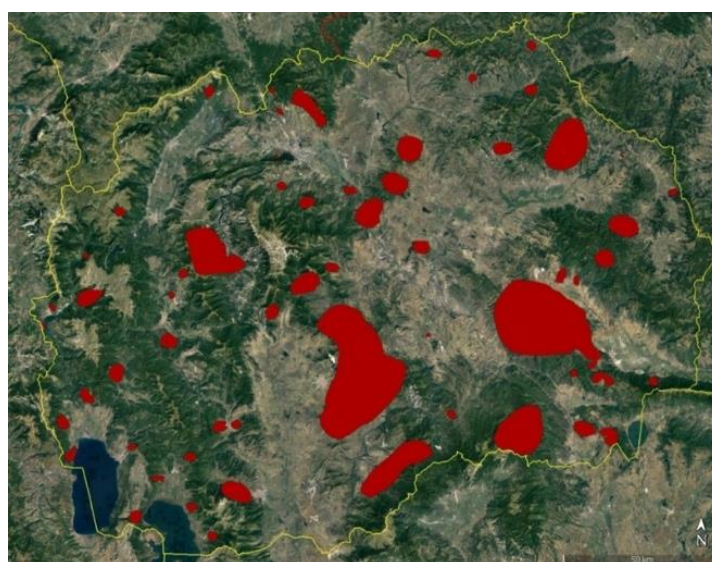


Figure 27. A country's distribution map of the Caesar's mushroom.

<sup>3</sup> Source: <http://redlist.moepp.gov.mk>



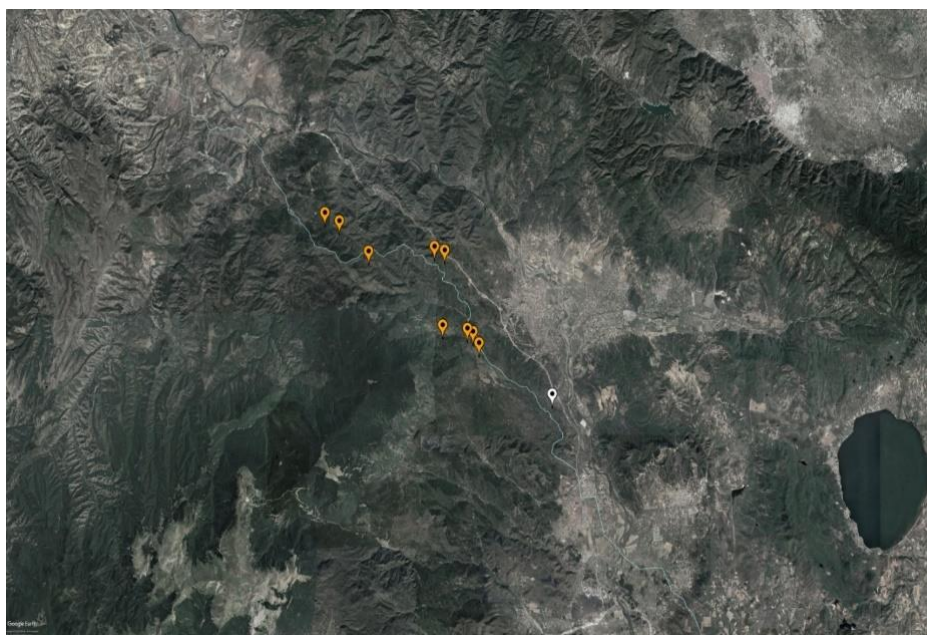


Figure 28. Locations of important fungi species within the pipeline corridor. Yellow placemark – *Amanita caesarea*; White placemark – *Byssomerulius hirtellus*

- **Fauna**

## **Invertebrates**

### **Terrestrial invertebrates**

#### Introduction

Information on terrestrial invertebrates (especially beetles) was collected based on the field studies conducted within the framework of the project (May-June 2022) as well as from field trips conducted in recent years (September 2021, November 2021 and March 2022 – personal field trips; June, August and September 2020 - for the purposes of the Bird & Bat Survey in Pre-Construction Phase for Wind Park Dren<sup>4</sup>; along with other personal field research undertaken in the last couple of years).

#### Methodology

- **Insects, with Emphasis on Beetles and Butterflies**

The fauna of beetles and butterflies is well-elaborated in the EIA Study from 2020 (TEHNOLAB)<sup>5</sup>. These species were covered in the description of all of the habitats in the area of interest.

Additional field research was conducted during the period April-June 2022, by applying methods of hand collection and use of exhaustor for beetles, coupled with netting and observation for butterflies. However, data from prior field research conducted for other goals were also used. The aim was to detect important species (internationally important species, endemics, rare species, etc), and to assess their status, distribution and potential impacts.

### **Saproxyllic Beetles**

<sup>4</sup> Kaltun Energy, 2019; Wind Park 'Dren', Macedonia – Pre-construction Bird and Bat Survey, Annual Report; Empiria EMS, Skopje and Clean Energy Consulting, Belgrade. <https://www.moepp.gov.mk/wp-content/uploads/2020/08/Annual-Report-Dren-wind-park-Mkd-pre-construction-bird-bat-survey.pdf>

<sup>5</sup> Tehnolab (2020). Студија за оцена на влијанието врз животната средина и социјалните аспекти на проектот Интерконективен гасовод Северна Македонија – Грција



Saproxylic beetles of importance (*Morimus funereus*, *Cucujus cinnaberinus*, *Cerambyx cerdo*, etc.) were studied by a line transect method.

*Table 5. Line transects for saproxylic insects*

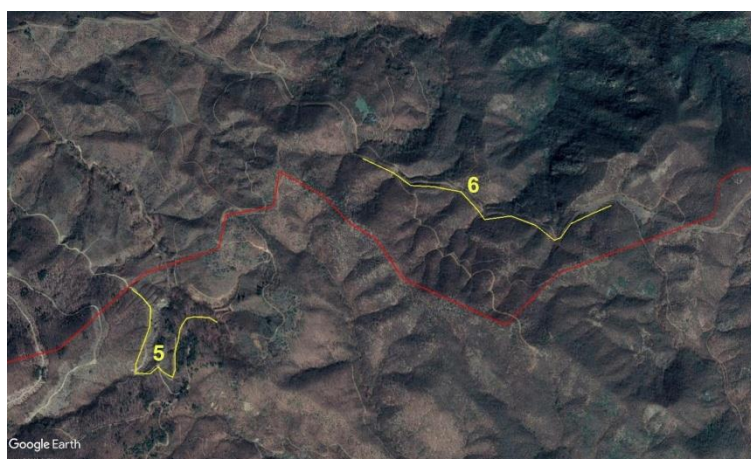
Transect No	Area	Transect Length (km)	Habitat	Period
1	Confluence of the Bosava and the Dosnica rivers	0.98	Riparian forest	May 2022
2	Confluence of the Bosava and the Dossnica rivers	0.77	Riparian forest	April 2022 May 2022
3	Dren village	0.33	Termophilous oak forest	June 2020 September 2021 May 2022
4	Koprishnica village	0.80	Italian and Turkey oak forest	September 2021 March 2021 May 2022
5	Marjanska Planina Mt	0.95	Sessile oak forest	May 2022
6	Marjanska Planina Mt	1.23	Sessile oak forest	September 2021 May 2022



*Figure 29: Line transects (May 2022) at the confluence of the Dosnica and Bosava rivers.*



*Figure 30: Line transects near the villages of Dren and Koprivnica.*



*Figure 31: Line transects on Marjanska Planina Mt.*

### Results from field surveys

- **Land Invertebrates (excl. Saproxylic Beetles)**

The rarity of species was assessed on the basis of scientific literature. In the case of ground beetles, the main source of information was the national catalogue of Carabidae of Macedonia<sup>6</sup>. For butterflies, we referred to Schaider & Jaksic (1990)<sup>7</sup>, etc.

<sup>6</sup> Hristovski, S., & Gueorguiev, B. (2015). Annotated catalogue of the carabid beetles of the Republic of Macedonia (Coleoptera: Carabidae). Zootaxa, 4002(1), 1-190.

<sup>7</sup> Schaider, P. & Jakšić, P. (1989). Die Tagfalter von Jugoslawisch Mazedonien (Rhopalocera und Hesperidae). Selbstverlag Paul Schaider, München, 199 pp.

Table 6. Important species of land invertebrates.

	Group	Locality	Habitat	Importance
<i>Helix philibinensis</i>	Gastropoda	Gagovi Nivi	Hill pasture	Balkan endemic
<i>Carterus gilvipes</i> (Piochard de la Brûlerie, 1873)	Coleoptera	Dren v., Kovacevi Nivi, 300-350 m,	Quercus coccifera forest	Rare species
<i>Laemostenus cimmerius weiratheri</i> J. Müller, 1932	Coleoptera	Dren v.	Degraded Quercus coccifera forest	Rare species
<i>Carabus convexus dilatatus</i>	Coleoptera	Marjanska Planina	All of the oak forests	Corine species
<i>Zerynthia Polyxena</i>	Lepidoptera	Manastirska Cuka, 4 km from the pipeline	Forest clearings	HD Annex IV



Figure 32: *Helix philibinensis*, 28.4.2022 (photo: S. Hristovski)

*Helix philibinensis* is only known from a small area in the Central Balkan, from the region around the Ohrid Lake to the east as far as the Island of Thasos. Interestingly, it inhabits a wide range of habitats, from the lowlands up to mountain peaks which reach almost 2000 m altitude. In the area of interest, it was recorded in dry grasslands (6220\* Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea), between Negotino and Demir Kapija. Common species in these habitat types in the whole Vardar valley. Its AOO is estimated at 80km<sup>2</sup>, while EOO is 40000 km<sup>2</sup> (Páll-Gergely 2011)

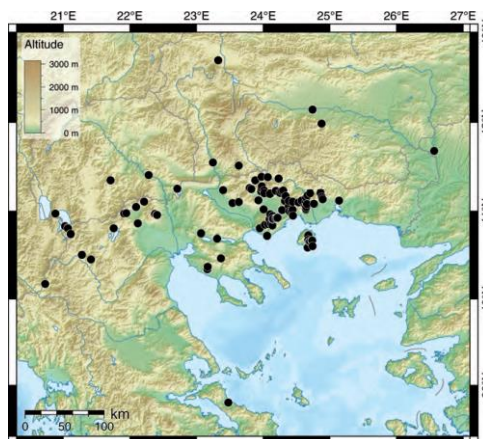


Figure 33: Distribution of *Helix philibinensis* (after Neubert 2014)

The southern Festoon (*Zerynthia polyxena*) is a butterfly species listed in Annex IV of the EU Habitats Directive. In North Macedonia, it is distributed throughout the country with most of the records in the valley or rivers Crn Drim, Treska, Crna Reka, Kriva Reka and Vardar. It inhabits meadow, especially along rivers as well as forest clearings. Only one specimen was observed in a oak forest clearing at the locality Manastirska Cuka which is cca 4 km away from the pipeline (outside of any project influence).

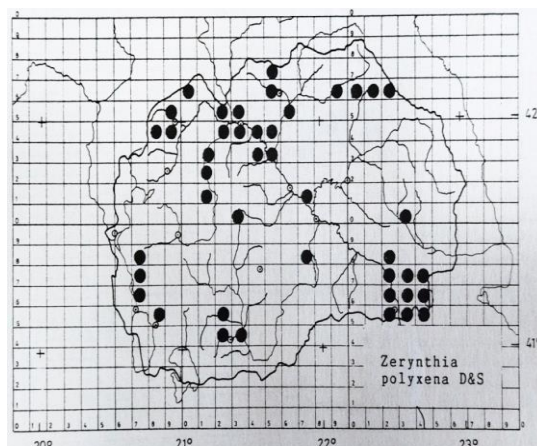


Figure 34: Distribution of *Zerynthia polyxena* in North Macedonia (after Neubert 2014)

### Saproxylc Beetles

During the field research conducted in the period April-June 2022, only one specimen of *Morimus funereus* was recorded, in the riparian forest at the confluence of the rivers Dosnica and Bosava. The specimen was spotted during the study along Transect #1. No other specimens of this species were recorded either in other line transects or during the research done opportunistically in 2022 or the year before.

Table 7: Results from the transect line method.

Transect No	Habitat	Recorded Important Saproxylc Species	Other Saproxylc Species
1	Riparian forest	<i>Morimus funereus</i> (1 ex.)	<i>Sinodendron cylindricum</i> , <i>Bostrichus capucinus</i> , <i>Plagionotus floralis</i> , <i>Neodorcadion bilineatum</i>
2	Riparian forest	/	<i>Sinodendron cylindricum</i> , <i>Pyrochroa cf. coccinea</i> , <i>Plagionotus floralis</i> , <i>Ampedus cf. sanguineus</i>
3	Termophilous oak forest	/	<i>Cerambyx scopolii</i> , <i>Stenurella bifasciata</i> , <i>Plagionotus floralis</i> , <i>Neodorcadion bilineatum</i> , <i>Dorcadion lineatocolle</i> , <i>D. aethiops</i> , <i>Herophila tristis</i>
4	Italian and Turkey oak forest	/	<i>Cerambyx scopolii</i> , <i>Xylotrechus rusticus</i> , <i>Herophila tristis</i> , <i>Stenurella septempunctata</i> , <i>Ampedus cf. sanguineus</i> , <i>Dorcadion lineatocolle</i> ,
5	Sessile oak forest	/	<i>Dorcus parallelepipedus</i> , <i>Stenurella bifasciata</i> , <i>Stenurella melanura</i>
6	Sessile oak forest	/	<i>Rhagium mordax</i> , <i>Stenurella melanura</i> , <i>Gnorimus nobilis</i> , <i>Trichius zonatus</i>





Figure 35: *Morimus funereus* on a stump of *Platanus orientalis* in the riparian forest along the Dosnica river, 28.4.2010 (photo S. Hristovski)

*Morimus funereus* is listed in Annex II to the EU Habitats Directive. It is also considered as a vulnerable (VU) species according to IUCN Red List (<https://www.iucnredlist.org>). In the area of interest it is most probably confined to the old-growth riparian habitats along the rivers Bosava and Dosnica. It is obvious that the oak forests in the area are highly-degraded due to forestry activities, and they do not support viable population of the current species. Thus, it can be assumed that *Morimus funereus* is distributed only in the riparian forests, as rendered on the following map:



Figure 36: EAAA for *Morimus funereus*.

It is distributed throughout the country but no population estimation has been attempted for the species. The national distribution is according to a map produced in 2016. The research in the Bregalnica watershed (2015-2021) yielded a significant number of new records of this species<sup>8</sup>.

<sup>8</sup> Hristovski, S. and Cvetkovska-Gjorgievska, A. (2021). Status and distribution of beetles of importance for the European Union and establishment of Natura 2000 sites. Macedonian Ecological Society. Nature Conservation Programme in North Macedonia.



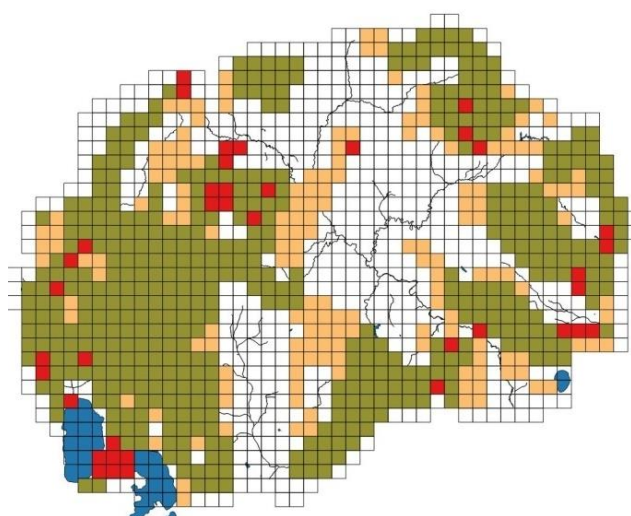


Figure 37: Distribution of *Morimus funereus* in North Macedonia<sup>9</sup> (red squares - good quality data; green squares - medium quality data; brown squares - poor quality data)



Figure 39. *Cerambyx scopolii* near Dren village, 30.5.2010 (photo S. Hristovski)

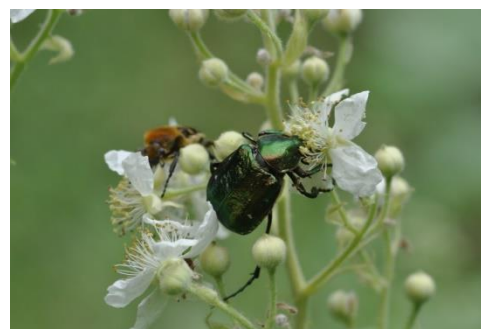


Figure 38. *Gnorimus nobilis* on Marjanska Planina Mt, 31.5.2010 (photo S. Hristovski)

#### • Aquatic invertebrates

The following methodology was employed: The dragonflies (Odonata) were recorded in adult stages by observation at the sampling points (S. Hristovski) Aquatic macroinvertebrates (Ephemeroptera, Plecoptera, Trichoptera, Annelida, etc) by analysis of literature data.

Table 8: Study sites for aquatic invertebrates.

	Habitat type	Crossings with Infrastructure	Coordinates	Comments
The Disanska Reka	Intermittent stream	Crossing with the gas pipeline	22.129859 41.451748	Completely dry during the spring of 2022 (the situation was the same in August 2020).
The Bosava	Hyporhithral stream	Crossing with the gas pipeline	22.223257 41.398571	Fish ponds and cascades constructed on the river.
The Dosnica	Hyporhithral stream	Crossing with the gas pipeline	22.224277 41.398143	Inflows into the Bosava at 70 m from the crossing with the gas pipeline.

<sup>9</sup> Hristovski, S. and Cvetkovska-Gjorgievska, A. (2016). Final Report on Working Group Land Invertebrates. Strengthening the capacities for implementation of Natura 2000 Project Reference Number: EuropeAid/136609/IH/SER/MK

	Habitat type	Crossings with Infrastructure	Coordinates	Comments
The Kopriska Reka	Metarhithral stream	Crossing with the gas pipeline	22.251602 41.362152	About 250m downstream from the reservoir used for irrigation; a very low waterflow during spring 2022, almost no water in summer/autumn periods in previous years.
The Drenska Reka	Metarhithral stream	Crossing with the dirt road	22.283075 41.354025	Gravel bank and weak Alnus belt.
The Stara Reka	Hyporhithral stream	Crossing with the gas pipeline	22.399685 41.302861	The oil pipeline is visible.
The Gabreska Reka	Hyporhithral stream	Crossing with the gas pipeline	22.405735 41.292394	Very close to the asphalt road (under the bridge).
The Zuica	Intermittent stream	Crossing with the motorway	22.491515 41.227644	Heavily modified due to the construction of the motorway with an artificial (concrete) bottom. Few ponds were present in April 2022.
The Kovanska Reka	Metarhithral stream	Crossing with the gas pipeline	22.492264 41.210313	Torrential flow during the spring and almost no water during the other seasons.
The Vardar	Epipotamal river	Crossing with the gas pipeline (oil pipeline is visible 80m upstream).	22.531444 41.172262	The width of the river Vardar is 98m. The riparian vegetation is very poor.



Figure 40: *Epallage fatime*, Kozhuf, 4.6.2020 (photo: S. Hristovski)

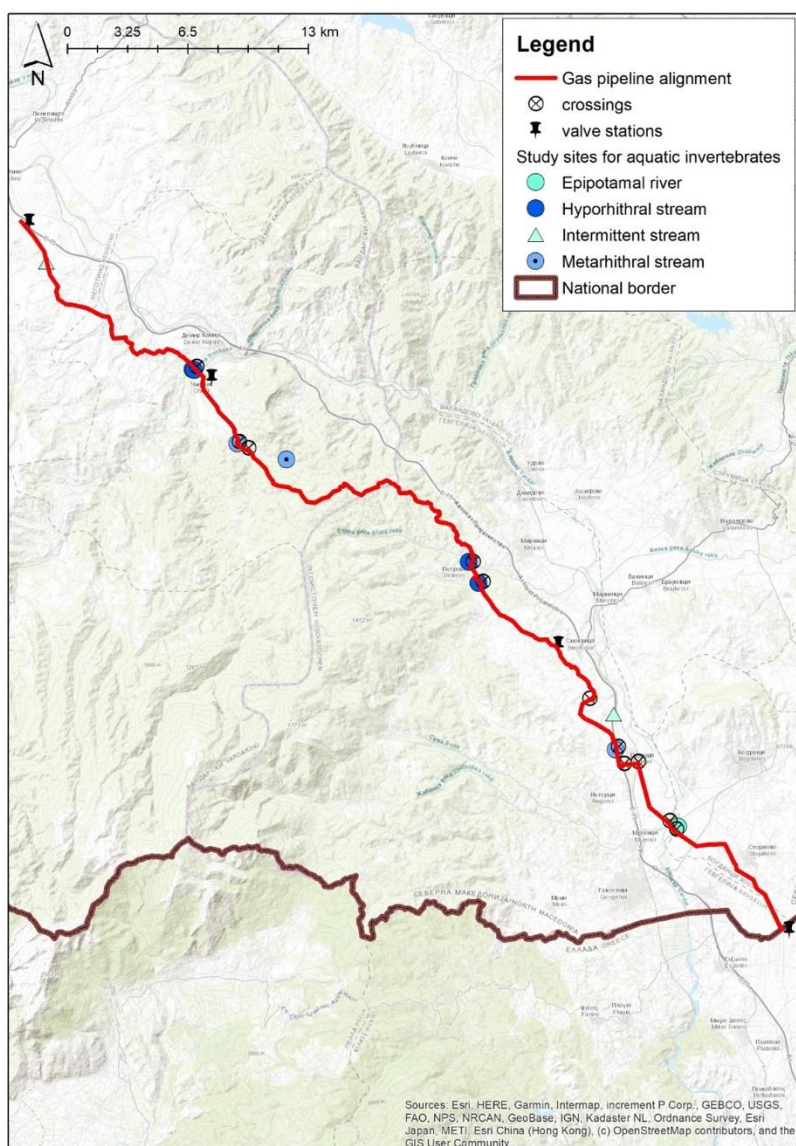


Figure 41: Study sites for aquatic fauna.



The Bosava, 22.236112 41.404069, 10.8.2021  
(photo: S. Hristovski)



Inflow of the Dosnica into the Bosava, 22.224106 41.398554, 28.04.2022 (photo: S. Hristovski)





A reservoir on the Kopriska Reka, 22.254882 41.361766, 21.11.2021 (photo: S. Hristovski)



The Drenska Reka, 22.298613 41.348885, 21.11.2021, (photo: S. Hristovski)



The Stara Reka, 22.410245 41.299204, 19.02.2022 (photo: S. Hristovski)



The river Vardar, 22.531444 41.172262,

Figure 42: Photographs of major waterbodies.

This Study comprises the results of field observations and literature review pertaining to fish fauna composition on several locations of the proposed pipeline alignment. It contains validated lists of species, characterisation of their distribution as well as significance on a local and regional level. Data on fish fauna from the upper watercourse of the river Vardar accompanied by description of fish and other biological features are presented in the papers by Grupce & Dimovski (1973), Georgiev et al (1991), Kostov et al (1998, 2000, 2001a). Fish fauna in the area of interest belongs to the Vardar watershed. The following fish species are known for the river Vardar and its tributaries: *Eudontomyzon hellenicus* Vlad., Ren., Kott & Econ., 1982, *Salmo trutta* Linnaeus, 1758, *Zingel balcanicus* (Karaman, 1936), *Vimba melanops* (Heckel, 1837), *Gobio banarescui* Dimovski & Grupce, 1974, *Chondrostoma vardarensis* Karaman, 1928, *Pachychilon macedonicus* Steindachner, 1892, *Sabanejewia balcanicus* Karaman, 1922, *Cobitis vardarensis* Karaman, 1928, *Barbus peloponnesius* Valenciennes, 1842.

Table 9: Faunistic composition of aquatic fauna at sampling points.

	Dragonflies	Ephemeroptera	Plecoptera	Trichoptera	Fish
Disanska Reka	<i>Onychogomphus forcipatus</i> , <i>Sympetrum depressiusculum</i>	/	/	/	/
Boshava	<i>Calopteryx splendens</i> , <i>Platycnemis pennipes</i> , <i>Onychogomphus forcipatus</i> , <i>Orthetrum brunneum</i> , <i>Crocothemis erythraea</i>	<i>Baetis rhodani</i> , <i>Baetis vernus</i> , <i>Epeorus assimilis</i> , <i>Rhithrogena semicolorata</i>	<i>Nemoura marginata</i> , <i>Perlodes dispar</i>		Fish community in this part is dominated by <i>Alburnoides bipunctatus</i> , <i>Barbus peloponnesius</i> and <i>Leuciscus cephalus</i> .
Doshnica	<i>Calopteryx splendens</i> , <i>Platycnemis pennipes</i> , <i>Onychogomphus forcipatus</i> , <i>Orthetrum brunneum</i>				
Koprishka Reka	<i>Calopteryx splendens</i> , <i>Orthetrum brunneum</i> , <i>Libellula depressa</i>				
Drenska Reka	<i>Calopteryx splendens</i> , <i>Orthetrum brunneum</i> , <i>Platycnemis pennipes</i> , <i>Cordulegaster sp.</i>			<i>Rhyacophila obtusa</i> , <i>R. polonica</i> , <i>Micropterna sequax</i>	Juvenile specimens of <i>Leuciscus cephalus</i> were observed.
Stara Reka	<i>Epallage fatime</i> , <i>Calopteryx splendens</i> , <i>Ischnura elegans</i> , <i>Pyrrhosoma nymphula</i> , <i>Onychogomphus forcipatus</i> , <i>Orthetrum brunneum</i>			<i>Glossosoma conformis</i> , <i>Hydropsyche incognita</i> , <i>Plectrocnemia conspersa</i> ,	
Gabreshka Reka	<i>Ischnura elegans</i> , <i>Onychogomphus forcipatus</i> , <i>Orthetrum brunneum</i>			<i>Philopotamus montanus</i> , <i>Hydropsyche incognita</i> , <i>Micropterna sequax</i>	
Zuica	<i>Onychogomphus forcipatus</i> , <i>Orthetrum brunneum</i>				<i>Alburnoides bipunctatus</i> , <i>Barbus peloponnesius</i> , <i>Cobitis vardarensis</i> , <i>Gobio sp.</i> , <i>Chondrostoma vardarensis</i>



	Dragonflies	Ephemeroptera	Plecoptera	Trichoptera	Fish
Kovanska Reka	<i>Onychogomphus forcipatus</i> , <i>Orthetrum brunneum</i>		<i>Brachyptera seticornis</i> , <i>B. macedonica</i>	<i>Drusus discolor</i> , <i>Micropterna sequax</i> , <i>Stenophylax meridionalis</i>	
Vardar	<i>Caloperys splendens</i> , <i>C. virgo</i> , <i>Erythromma lindenii</i> , <i>Onychogomphus forcipatus</i> , <i>Orthetrum brunneum</i> , <i>O. coeruleascens</i>		<i>Brachyptera graeca</i> , <i>B. macedonica</i> , <i>Taeniopteryx stankovici</i> , <i>Capnioneus balcanica</i> , <i>Isoperla oxylepis</i> , <i>I. submontana</i> ,		Fish fauna is dominated by <i>Rhodeus amarus</i> , <i>Alburnoides bipunctatus</i> , <i>Barbus peloponnesius</i> and <i>Pseudorasbora parva</i> .

## Valorization

Fish were evaluated pursuant to Habitat Directive (Directive 92/43/EEC); the Global Red List (IUCN); Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention); Convention on the Conservation of Migratory Species (Bonn Convention); and the Convention on International Trade in Endangered Species (CITES).

Table 10: Valorization of fish fauna

Scientific Name	Common English Name	Common Macedonian Name	Global IUCN Threat Category	Habitats Directive 92/43/EEC	Bern	Bonn	CITES
<i>Salmo trutta</i> Linnaeus, 1758	Brown Trout	Поточна пастрмка	LC	II	-	-	-
<i>Zingel balcanicus</i> (Karaman, 1936)	Vardar Little Chop	Вардарски вретенар	LC	-	-	-	-
<i>Vimba melanops</i> (Heckel, 1837)	Balkan Vimba	Попадика	DD	II	II	-	-
<i>Gobio banarescui</i> Dimovski & Grupce, 1974	Macedonian Gudgeon	Вардарска кркушка (говедарка)		-	-	-	-
<i>Chondrostoma vardarensis</i> Karaman, 1928	Vardar Nase	Вардарски бојник (скобуст)		II	-	-	-
<i>Pachychilon macedonicus</i> Steindachner, 1892	Vardar Roach	Вардарски моранец	LC	-	-	-	-
<i>Cobitis vardarensis</i> Karaman, 1928	Vardar spined loach	Вардарска штипалка	LC	-	-	-	-
<i>Phoxinus phoxinus</i> (Linnaeus, 1758)	Common minnow	Гомнушка	LC	II, IV	-	-	-
<i>Sabanejewia balcanicus</i> Karaman, 1922	Golden Loach	Златна штипалка	LC	-	-	-	-
<i>Barbus balcanicus</i> (Kotlik, Tsigenopoulos, Rab&Berrebi, 2002)	Danube Barbel	Црна мрена	LC	II, V	-	-	-

The following five species can be considered as important (listed in the annexes to the Habitats Directive and/or the Bern Convention): *Salmo trutta* Linnaeus, 1758, *Barbus balcanicus* (Kotlik, Tsigenopoulos, Rab & Berrebi, 2002), *Vimba melanops* (Heckel, 1837), *Alburnoides bipunctatus* Bloch, 1782), *Phoxinus phoxinus* (Linnaeus, 1758). A brief description of the significance of these species is provided as well as a distribution map<sup>10</sup>. It is only the distribution of *Alburnoides bipunctatus* that was taken from FREDIE<sup>11</sup>.

<sup>10</sup> Freyhof, J. & Kottelat, M. 2008. *Phoxinus phoxinus*. The IUCN Red List of Threatened Species 2008: e.T17067A6795882. <https://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T17067A6795882.en>. Accessed on 9 June 2022.

<sup>11</sup> Freshwater Diversity Identification for Europe. 21st Century Identification Techniques for Europe's freshwater biodiversity. [www.ittiofauna.org](http://www.ittiofauna.org)

*Salmo trutta* Linnaeus, 1758 – the brown trout. It is listed in Annex II to the Habitats Directive. It inhabits clean waters in the upper parts of the Vardar river tributaries in Kozhuf Mt. It has been granted a Least Concern (LC) status only in the IUCN Red List.

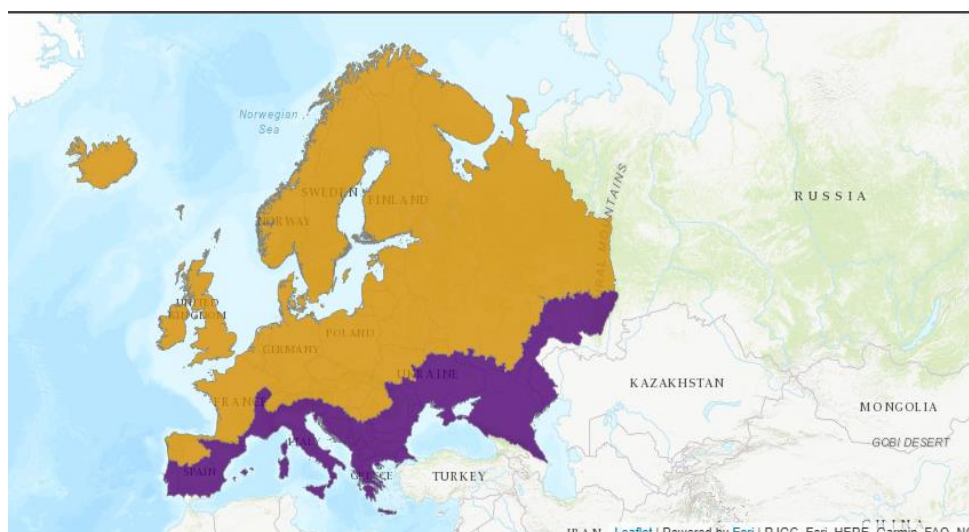


Figure 43: Global distribution of *Salmo trutta* (yellow – extant; violet – extant and Introduced)

*Barbus balcanicus* (Kotlik, Tsigenopoulos, Rab&Berrebi, 2002) – the Danube barbel. *Barbus meridionalis* is part of Annex II to the Habitat Directive and Appendix III to the Bern Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). In the past, in the Republic of Macedonia, a few subspecies of the current species used to be defined, including the Danube barbel – an inhabitant of the river Vardar watershed. The taxonomic status of the Danube barbel from the river Vardar watershed underwent a range of alterations in the past. Nowadays, its status has been elevated, and it has been granted the status of a separate species under the name *Barbus balcanicus* Kotlik, Tsigenopoulos, Rab & Berrebi, 2002. On the one hand, Freyhof and Brooks (2011) suggest that *Barbus balcanicus* should be registered in Annex V to the Habitat Directive (Directive 92/43/EEC). On the other hand, in line with the recommendations from Article 17 Checklist, *Barbus balcanicus* ought to retain the status held by *Barbus meridionalis*. Attributable to the aforesaid reasons, *Barbus balcanicus* is both categorised in Annex II and Annex V. In the Global Red List (IUCN) as well as in the European and the Mediterranean Red List, the Danube barbel is categorised as a Least Concern species (LC).



Figure 44: Global distribution of *Barbus balcanicus*.

*Vimba melanops* (Heckel, 1837) – the Balkan Vimba. It inhabits rivers and streams, usually with a relatively swift current. It also occurs in lakes and lowland water courses with little current. It feeds on invertebrates and plants. It is found in the Aegean Sea basin in Greece (Thessaly, Macedonia and Thrace), and in adjacent Bulgaria, North Macedonia, and northwestern Turkey (Evros drainage). It inhabits rivers and freshwater reservoirs.

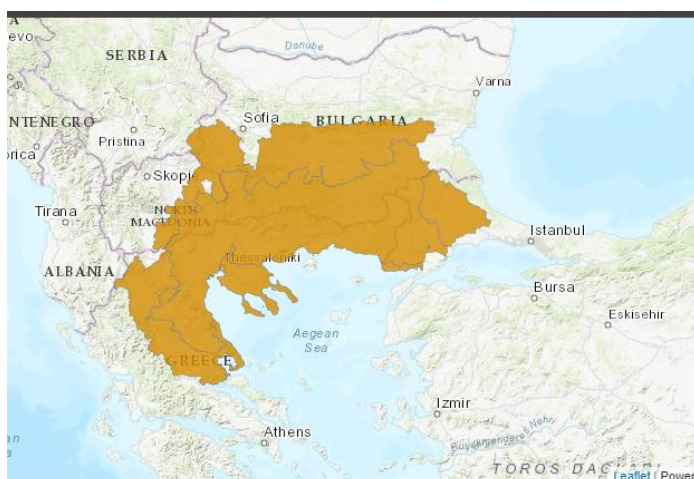


Figure 45: Global distribution of *Vimba melanops*.

*Alburnoides bipunctatus* Bloch, 1782) – the spirlin. Stierandova et al (2016) have identified an Aegean fish group within the framework of the genus *Alburnoides*, distinct from the Midwest European group, to which the species *Alburnoides bipunctatus stricto* is affiliated. Judging from the latest findings, the Vardar river basin is inhabited by *Alburnoides thessalicus* (Barbier et al. 2017). *Alburnoides bipunctatus* is cited in Annex III to Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention). It has been granted a Least Concern (LC) status only in the European Red List.

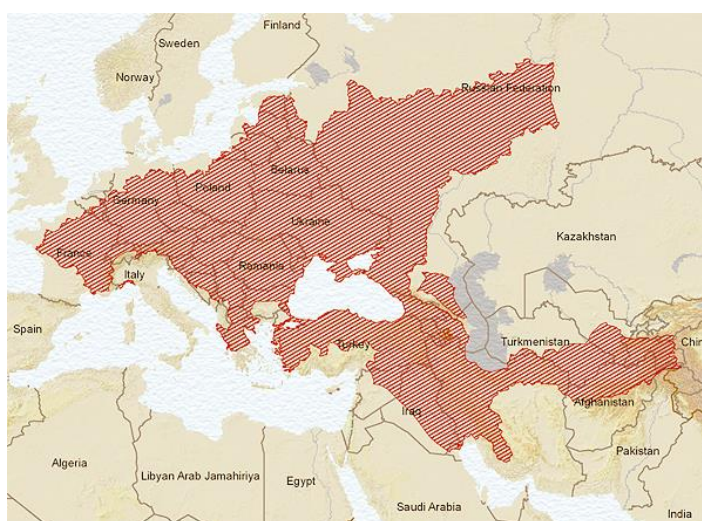


Figure 46: Global distribution of *Alburnoides bipunctatus*.

*Phoxinus phoxinus* (Linnaeus, 1758) – the common minnow. The genus is widely distributed in the basins of the Atlantic Ocean, the North and the Baltic Sea, the Pacific and the Arctic Oceans, from the Ebro river basin in Spain to the Amur river basin in Russia and China. Since the early 20th century, the minnows have dispersed outside their natural area of distribution, especially in the Scandinavian alpine regions, where they are used as live bait, and in the Pyrenean Peninsula, where they are stocked as a natural food for trout. Today, the Eurasian minnow from the genus *Phoxinus* comprises at least 15 species, acclimatised to cold and well-aerated alpine watercourses and to wide lowland rivers and lakes. *Phoxinus phoxinus* is categorised in Annexes II and IV to the Habitat Directive. Pursuant to the Global Red List (IUCN) and the European and the Mediterranean Red List, the common minnow is categorised as a Least Concern (LC) species.



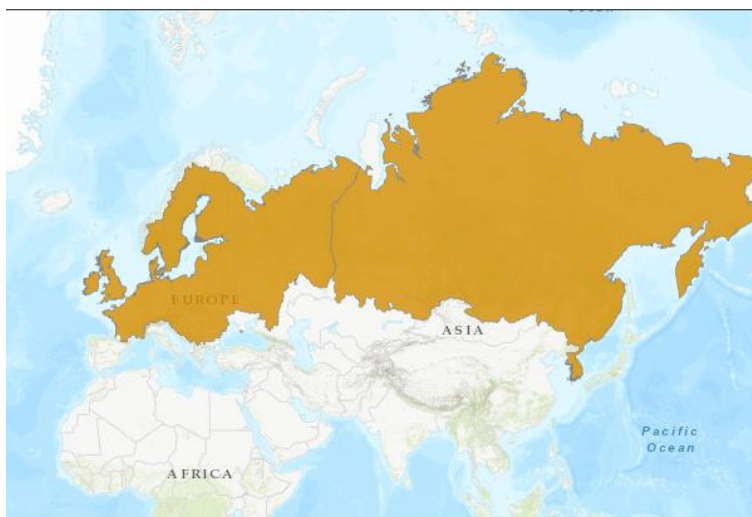


Figure 47: Global distribution of *Phoxinus phoxinus*.

The results of field surveys and literature review concerning aquatic macro invertebrate fauna in the projected pipeline area, undertaken between April and June 2022, are elaborated in the current study. It includes a list of species, their distribution as well as significance on a local and regional level.

Aquatic invertebrate samples were collected from the previously selected sampling sites along the river Vardar and its tributaries. Unfortunately, aquatic invertebrate samples were not collected from the Disanska Reka stream since there was not any water in the riverbed. Aquatic invertebrates at all sampling sites were collected by employing the Kick sampling method, a technique in which submerged aquatic vegetation, stones and other hard substrates are disturbed to encourage organisms to fall in the 500 µm mesh net. The samples were preserved with 96% ethanol and transferred into sample containers. All specimens were identified to the lowest possible taxonomic category by using Nikon SMZ10 stereomicroscope and proper identification keys. Once the identification list of determined taxa was produced, a detailed analysis on composition of macroinvertebrate fauna (Odonata, Ephemeroptera, Plecoptera, Trichoptera) was performed. Valorisation of biodiversity in accordance with the IUCN Red Lists criteria as well as Habitats Directive Annexes was undertaken, and a list of species of conservation importance occurring in the project area was compiled to assess biodiversity values against EBRD PR6 criteria, and detect possible priority biodiversity features or critical habitats.

All of the dragonfly species are assessed as Least Concern (LC) although some of them are Not Evaluated (NE). None of them are listed in the annexes to the EU Habitats Directive. None of the species have been granted any conservation status according to the IUCN's List of Threatened Species, and they have not been listed in the annexes to the EU Habitats Directive / Bern Convention.

## Herpetofauna

### Introduction

Within this Study, the findings are presented regarding the qualitative and quantitative research into amphibians and reptiles undertaken in 2022 as well as the available literature for these classes that refers to the project area and its vicinity. It highlights the distribution of amphibians and reptiles, their valorization in accordance with the national and international legislation, their significance on a local and regional level, along with recommendations for their preservation during the gas pipeline construction and operation.

The amphibian and reptile surveys were focused on a 1,000 m wide corridor on the central line of the proposed gas pipeline. This area is considered appropriate for a survey, and it is sufficiently large to encompass most impacts arising during the construction works and operational needs in the projected area. For species and their habitats recognized as PBFs and/or CHs, ecologically appropriate areas of analysis (EAAA) should be defined and surveyed.



The overview of findings is as follows:

- A list of any known species of particular conservation concern, including those listed in Annexes II, and IV to the Habitats Directive, National Red Lists, the IUCN Red List – global and European;
- Critical habitats (CH) for amphibians and reptiles;
- Species of conservation significance, which may be described as „priority biodiversity features“(PBF).

### Methodology

Amphibians and reptiles do not constitute a monophyletic group, but still, they are often treated together under the rubric of herpetology for the reason that they are terrestrial vertebrates sharing the plesiomorphic physiological traits of ectothermy and poikilothermy (Russel et al, 2005). They share certain aspects of their general biology due to these traits despite their considerable difference in terms of basic aspects of anatomy, physiology, behaviour and reproductive biology, and there are also huge differences in their ecology (Russel et al, 2005). Therefore, although field research is conducted for both classes concurrently when undertaking SEIA studies, in order to distinguish the impact upon each class, they ought to be analysed independently.

The prime aspect regarding amphibians and reptiles was to determine the quality and quantity composition of these systematic classes, especially in the preferred habitats, and regarding threatened recognised species. Field surveys were mostly done in the morning when the frequency of day/night activity of these species is higher. Samples observed in the field were identified consistent with the field guides by Radovanović (1951) and Arnold & Owenden (2002). The techniques used during the fieldwork for these two classes were as follows:

- Methodology for determining species presence/distribution with the ‘search-and-seize’ technique (Vogt 1982). It involved active searching in order to determine species presence in a particular location or area.
- Methodology of line transect (Buckland et al., 1993), (Everitt 2002). These methods were used to determine biodiversity richness, density and size of populations, for one simple reason that is characteristic of low-mobility animals (McDiarmid et al., 2012). Also, this technique represents an approach that is easily conducted, in a brief monitoring period (two active seasons at the minimum), and with a small capacity in terms of human resources. The transect survey technique is used to measure the relative abundance of selected species and known sub- populations. Regular surveys are the basis for assessing the impact of threats to amphibian reptile populations.
- Audio recorded surveys. Male frogs and toads during the mating season call to attract females. During this period, they tend to be quite visible. These calls are species-specific, so that recording the so-called “frog choirs” during breeding season can help identify the presence of species and their relative abundance. This technique has the advantage of easily covering fairly large areas, such as an inventory of lakes or larger swamps or ponds. Regular auditory surveys/recordings can be very useful in determining the composition of species as it is an easy application technique. However, there are some limitations when it comes to monitoring population change. This technique is especially fast and useful for inventories, but when it comes to determining the status of species, it should always be used in combination with other monitoring techniques (Sterijovski & Arsovski 2021).

### Results of field surveys

The overview of findings is as follows:

- A list of any known species of particular conservation concern, including those listed in Annexes II, and IV to the Habitats Directive, National Red Lists, the IUCN Red List – global and European;
- Critical habitats (CH) for amphibians and reptiles;
- Species of conservation significance, which may be described as „priority biodiversity features“(PBF).

## Amphibians

### Literature Analysis

Research into the qualitative composition of amphibians and reptiles in the project area was done partially at certain locations, such as the vicinity of Dren village near Demir Kapija, the Kovanska Reka river near Gevgelija, and Gjavato village near Bogdanci. Besides the current study, the data used for establishment of the National Red List of Amphibians (Sterijovski & Arsovski 2020) was used. According to literature data, there are 6 species of amphibians distributed in this area, as follows: *Salamandra salamandra*, *Bombina variegata*, *Bufo bufo*, *Bufotes viridis*, *Hyla arborea*, *Pelophylax ridibundus*.

### Field Research Activities

The field survey of amphibians was conducted over eight days in April, May and June 2022 (13, 14 and 17 April; 26-29 May; and 10 June). The research was carried out in the morning when the frequency of day / night activity of these two classes is higher. The survey was conducted in a 500-meter corridor on both sides of the pipeline route. This was done in order to have a greater choice of preferred habitats for the species of this taxonomic group in the project area.

*Table 11. List of amphibian species recorded in literature and during field research along the pipeline corridor.*

Scientific Name	English Name	Macedonian Name
<i>Salamandra salamandra</i> (Linnaeus 1758)	Fire salamander	Дождовник
<i>Bombina variegata</i> (Mertens & Muller 1928)	Fire belly toad	Жолт мукач
<i>Hyla arborea</i> (Linnaeus 1758)	European tree frog	Гаталинка
<i>Bufo bufo</i> (Mertens & Muller 1928)	Common toad	Обична крастава жаба
<i>Bufotes viridis</i> (Laurenti 1768)	Green toad	Зелена крастава жаба
<i>Rana graeca</i> Boulenger 1891	Greek stream frog	Поточна жаба
<i>Rana dalmatina</i> Fitzinger 1839	Agile frog	Шумска жаба
<i>Pelophylax ridibundus</i> (Pallas 1771)	Marsh frog	Езерска жаба

Out of 14 species of amphibians documented from Macedonia (Sterijovski & Arsovski 2020), 8 were found during field research; hence, the findings from the projected pipeline area constitute 57.1% of all amphibian species recorded on a national level (Map 1).

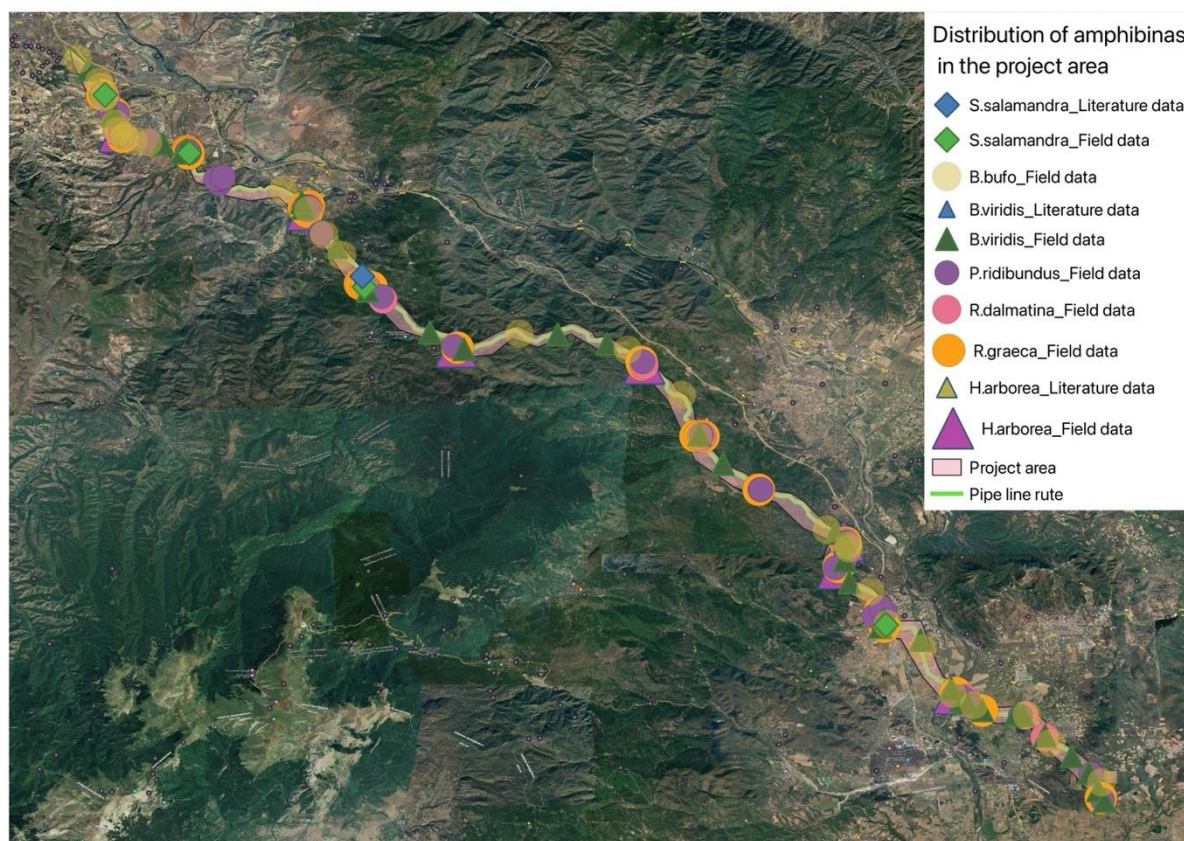


Figure 48: Distribution of amphibians in the project area

Given the habitat preferences of amphibian species, pipeline length, and the fact that elevation ranges between 110 m (in the Maleolu locality near the village of Stojakovo) and 938 m (peak Studena Glava) in Marjanska Mt, with diversity of several types of habitats (such as agricultural arable land, orchards, hill pastures, riparian belts, oak forests, beech forests), points were selected, easily accessible to conduct field research aimed at identification of the qualitative composition of amphibians mainly targeting aquatic ecosystems. In total, 172 records for the eight species of amphibians were collected (Figure 48).

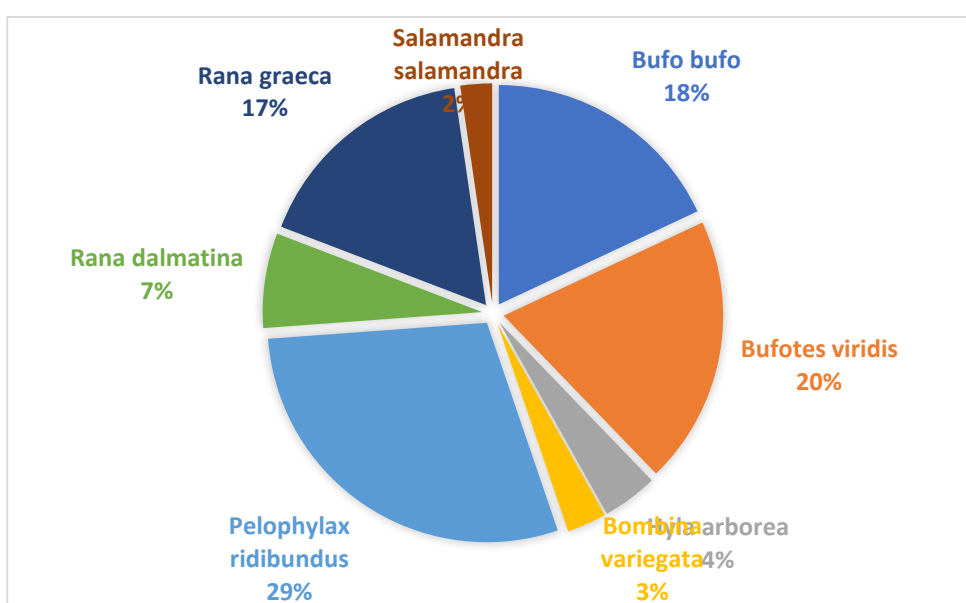


Figure 49: Percentage of amphibian species frequency

The most frequent species was *P. ridibundus* with 50 records; *B. viridis*, *B. bufo* and *R. graeca* with 34, 31 and 29 records, and *R. dalmatina* with 12 records. The other species were with less than 10 records in all the surveyed area. All 172 records were observed in 8 habitat types such as: hilly meadows, oak forest, fagus forest, mixed forest, riparian woodlands, rivers and streams, agricultural area (fields, acres, orchards), and urban and urbanized areas. The frequency of species records by habitat type is provided in Fig. 50.

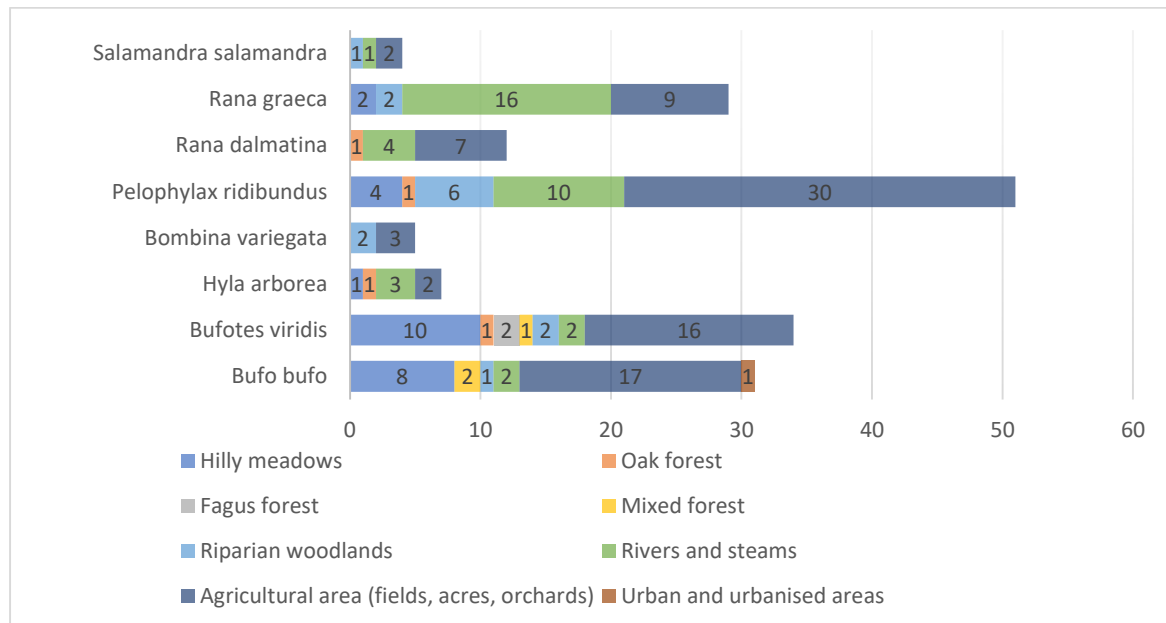


Figure 50: Number of records by species by habitat

By far most records of *P. ridibundus* were found in the permanent and temporary ponds in the agricultural areas (30 records) as well as of the species *B. bufo* and *B. viridis* (with 17 and 16 records). Rivers and streams are also favorable for *R. graeca* (with 16 records) and again *P. ridibundus* (with 10 records).



Figure 51: A riparian belt near the river Vardar - Gjavato.

The most diverse habitat by number of amphibian species is agricultural areas (Fig. 52), with all 8 recorded taxa. Rivers and streams follow with 7 species, and riparian woodlands with 6 species.





Figure 52: Agricultural areas in the project area near Negotino.

Hilly meadows and oak forest are hosts to 5 and 4 taxa respectively while beech forests and urban and urbanized areas are hosts to one amphibian species (Fig. 53)

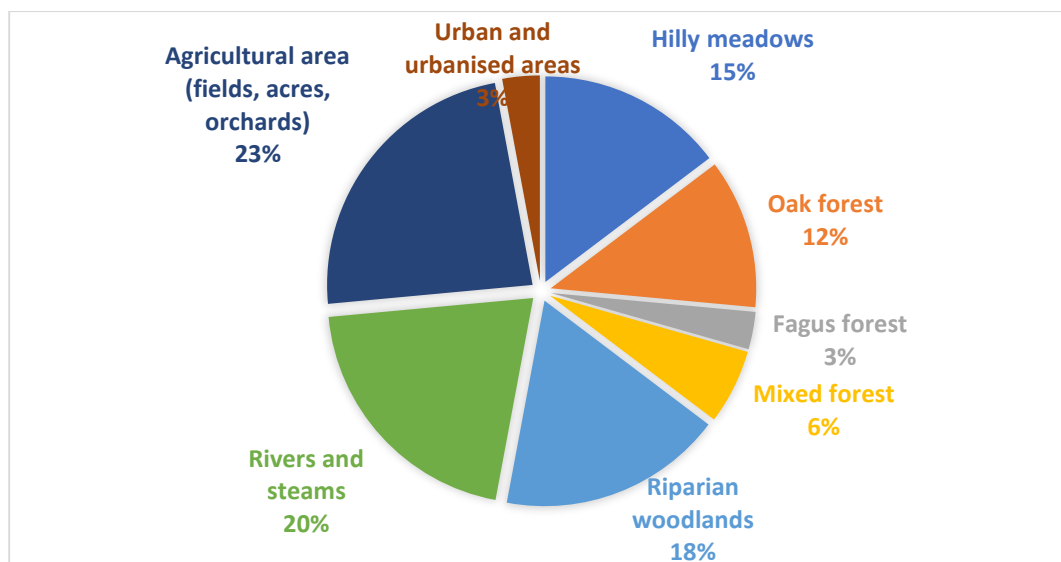


Figure 53: Percentage of species by habitat

## Results and Analyses

Valorization of amphibians was done consistent with the national and international conventions and legislation on protection of threatened species on national, European or global level. This includes the following: National Red List of Threatened Amphibians; IUCN Global Red List; IUCN European Red List; Habitats Directive Annex II, Annex IV and Annex V; Bern Convention – Conservation of European Wildlife and Natural Habitats; CITES Convention - Convention on International Trade in Endangered Species; List of Strictly Protected and Protected Wild Species (MOEPP 2011); Endemism (Tab.12).



Table 12: Valorization of amphibians in the pipeline corridor area.

Amphibians		National Red Lists	IUCN Global (2021-1)	IUCN EU (2021-1)	Habitat Directive (Annex II, IV, V)	Bern Convention (Appendix II, III)	CITES (Appendix II)	List of Strictly Protected and Protected Wild Species	Endemism	PBF/CH
1	<i>Salamndra Salamandra</i>	LC	LC	LC	/	III	/	Protected	/	/
2	<i>Bombina variegata</i>	LC	LC	LC	II, IV	II	/	Protected	Balkan endemic <sup>12</sup>	PBF
3	<i>Pelophylax ridibundus</i>	LC	LC	LC	V	III	/	/	/	/
4	<i>Rana graeca</i>	NT	LC	LC	IV	II	/	Protected	/	/
5	<i>Rana dalmatina</i>	NT	LC	LC	IV	III	/	Protected	/	/
6	<i>Bufo bufo</i>	LC	LC	LC	/	III	/	/	/	/
7	<i>Bufotes viridis</i>	LC	LC	LC	IV	II	/	Protected	/	/
8	<i>Hyla arborea</i>	NT	LC	LC	IV	II	/	Protected	/	/

The results of analysis on amphibians in the pipeline corridor area are as follows:

- According to the National Red List of Amphibians (Sterijovski & Arsovski, 2020), three species (*R.dalmatina*, *R.graeca* and *H.arborea*) are deemed near threatened (NT); all other amphibian species are assessed as least concern (LC).
- In line with the IUCN Red List of Threatened Species - Global and European (Version 2020-2), all amphibian species are categorized as least concern (LC).
- In the EU Habitat Directive, only one species (*B.variegata*) is part of Annex II while five species (*B.variegata*, *R.dalmatina*, *R.graeca*, *B.viridis* and *H.arborea*) are enshrined in Annex IV. One species (*P.ridibundus*) is listed in Annex V.
- As regards the Bern Convention, four species are in Appendix II (*B.variegata*, *R.graeca*, *B.viridis* and *H.arborea*) whereas all other listed species are listed in Appendix III.
- None of the species occurring in the pipeline area are on the CITES List.
- Six species (*S.salamndra*, *B.variegata*, *R.dalmatina*, *R.graeca*, *B.viridis* and *H.arborea*) are quoted as protected in the National List of Strictly Protected and Protected Wild Species.
- One subspecies (*B.variegata scabra*) is considered a Balkan endemic.
- According to the EBRD PR6 Guidance Note, only *Bombina variegata* is considered a Priority Biodiversity Feature owing to the fact that it is part of the Habitat Directive (Annex II and IV) and the National List of Protected Wild Species, and it is also considered a Balkan endemic.

## Reptilians

### Literture Analysys

Study into the qualitative composition of reptiles in the project area was conducted at a number of locations, such as the vicinity of Dren village near Demir Kapija, the Kovanska Reka river near Gevgelija, and Gjavato village near Bogdanci. In addition to the current study, the data sourced for establishment of the National Red List of Amphibians (Sterijovski & Arsovski 2020) were also used. According to literature

<sup>12</sup> According to Pabijan et al (2013), the subspecies of *Bombina variegata scabra* is present in the Balkans.

data, there are 3 amphibian species distributed in this area, as follows: *Emys orbicularis*, *Lacerta trilineata* and *Vipera ammodytes*.

### Field Research Activities

The field survey of amphibians was conducted over eight days in April, May and June 2022 (13, 14 and 17 April; 26-29 May; and 10 June). The research was carried out in the morning when the frequency of day / night activity of these two classes is higher. The survey was conducted in a 500-meter corridor on both sides of the pipeline route. This was performed so as to have greater choice of preferred habitats for the species. On the basis of both literature and field research data, 20 species of this class have been recorded in the project area (Table 13).

Table 13: List of reptile species within the project pipeline corridor recorded in literature and during field research.

Scientific Name	English Name	Macedonian Name
<i>Testudo graeca</i> (Linnaeus 1758)	Greek tortoise	Шумска желка
<i>Testudo hermanni</i> (Gmelin 1788)	Herman's tortoise	Ридска желка
<i>Emys orbicularis</i> (Linnaeus 1758)	Pond turtle	Блатна желка
<i>Anguis fragilis</i> (Linnaeus 1758)	Slowworm	Слепче
<i>Pseudopus apodus</i> (Pallas, 1775)	European Glass Lizard	Блавор
<i>Mediodactylus kotschy</i> (Steindachner, 1870)	Kotschy's gecko	Гекон
<i>Lacerta trilineata</i> (Bedriaga 1886)	Balkan green lizard	Голем зелен гуштер
<i>Lacerta viridis</i> (Laurenti 1768)	Green lizard	Зелен гуштер
<i>Podarcis erhardi</i> (Bedriaga 1882)	Erhard's wall lizard	Балканска гуштерица
<i>Podarcis muralis</i> (Laurenti 1768)	Wall lizard	Сидна гуштерица
<i>Podarcis tauricus</i> (Pallas, 1814)	Balkan wall lizard	Полска гуштерица
<i>Dolichophis caspius</i> (Gmelin 1789)	Caspian whip snake	Жолт смок
<i>Coronella austriaca</i> Laurenti, 1768	Smooth snake	Планински смок
<i>Elaphe quatuorlineata</i> (Lacepede 1789)	Four-lined snake	Ждрепка
<i>Platycephalus najadum</i> (Eichwald 1831)	Slender whip snake	Џитка
<i>Malpolon insignitus</i> (Hermann 1804)	Eastern Montpellier snake	Длабокоочелен смок
<i>Zamenis longissimus</i> (Laurenti, 1768)	Aesculapian snake	Шумски смок
<i>Natrix natrix</i> (Linnaeus 1758)	Grass snake	Белоушка
<i>Natrix tessellata</i> (Laurenti, 1768)	Dice snake	Рибарка
<i>Vipera ammodytes</i> (Linnaeus 1758)	Nose-horned viper	Поскок

Bearing in mind that there are 32 species of reptiles recorded for the Republic of North Macedonia (Sterijovski et al. 2014), 62.5% of the total species recorded on a national level occur in the project area



and its vicinity. Distribution from literature data and field work concerning tortoises, lizards and snakes is rendered in maps 2, 3 and 4 respectively.

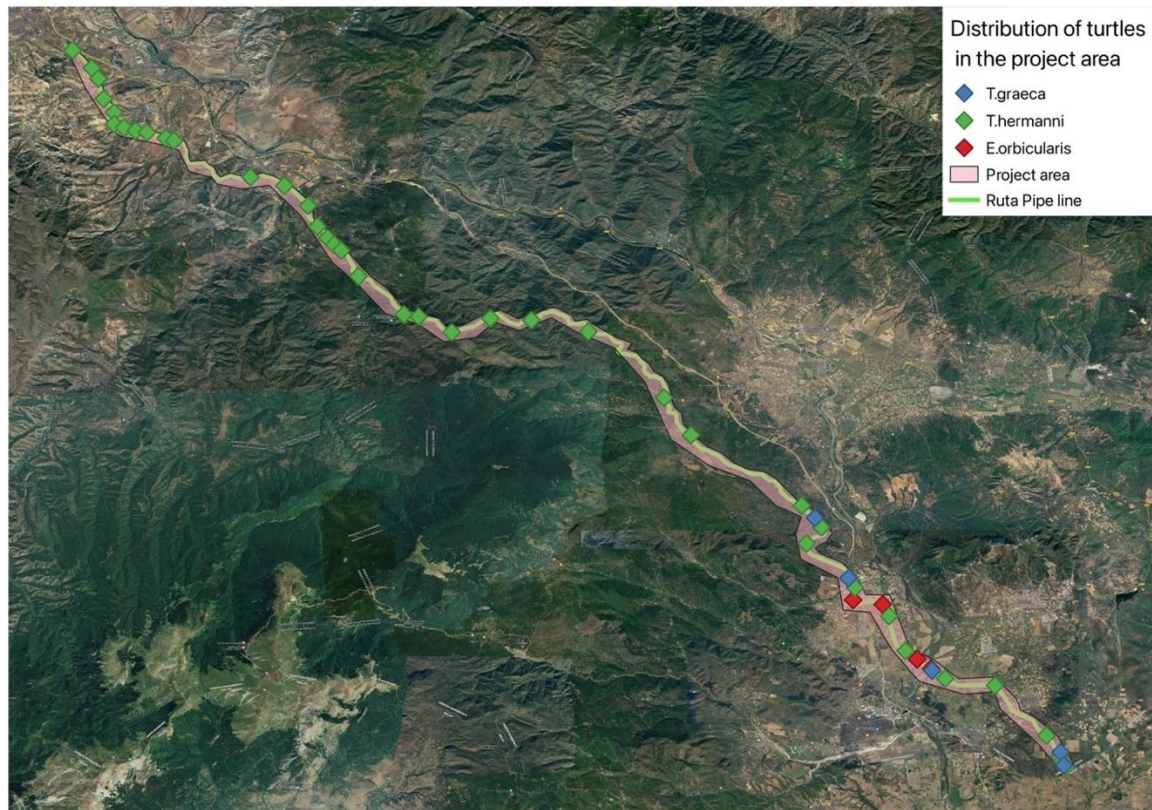


Figure 54: Distribution of turtles in the project area

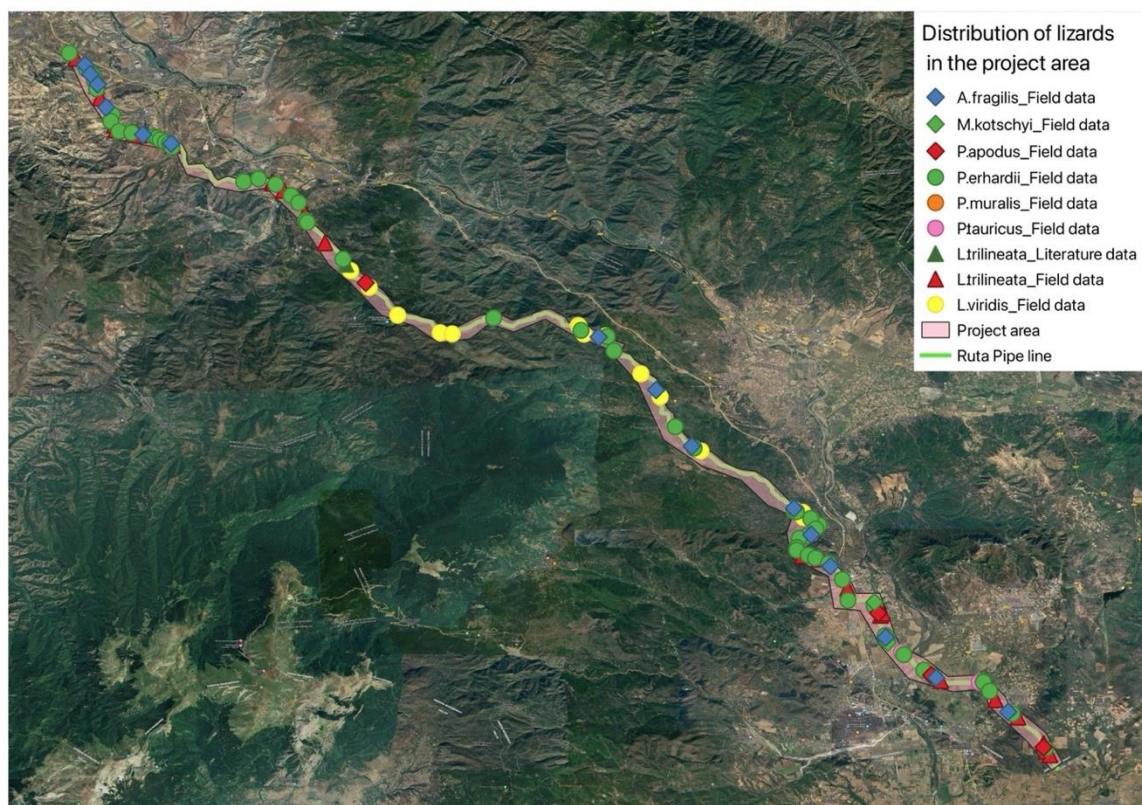


Figure 55: Distribution of lizards in the project area



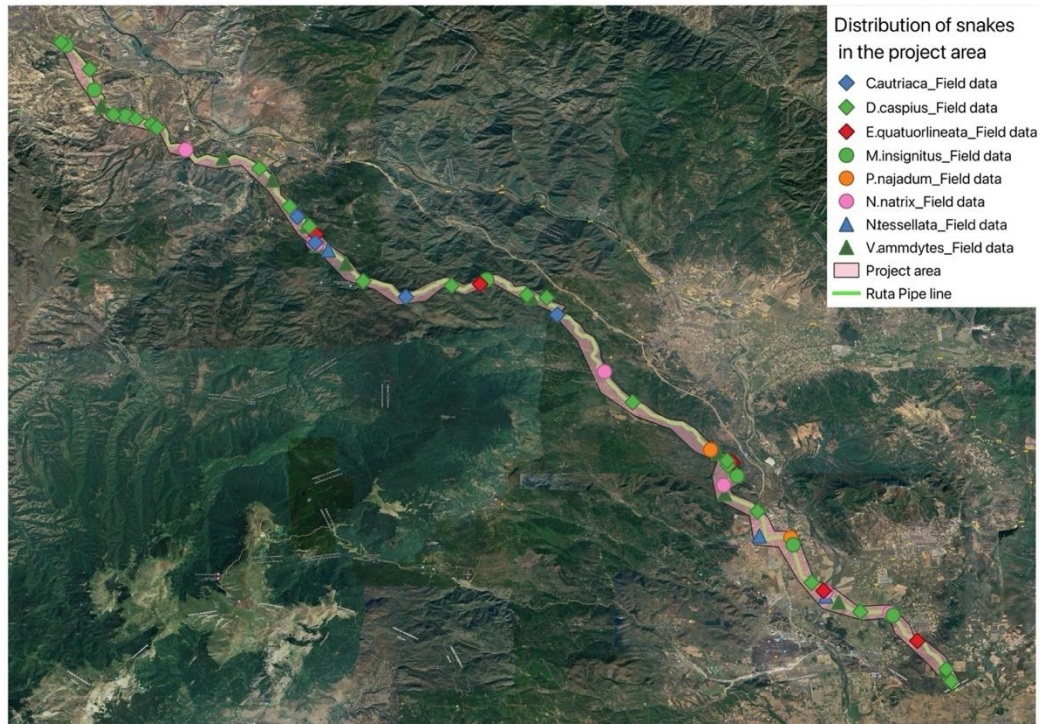


Figure 56: Distribution of snakes in the project area

During field surveys, 260 records in total were noted for 20 reptile species distributed along the pipeline corridor (Fig. 57).

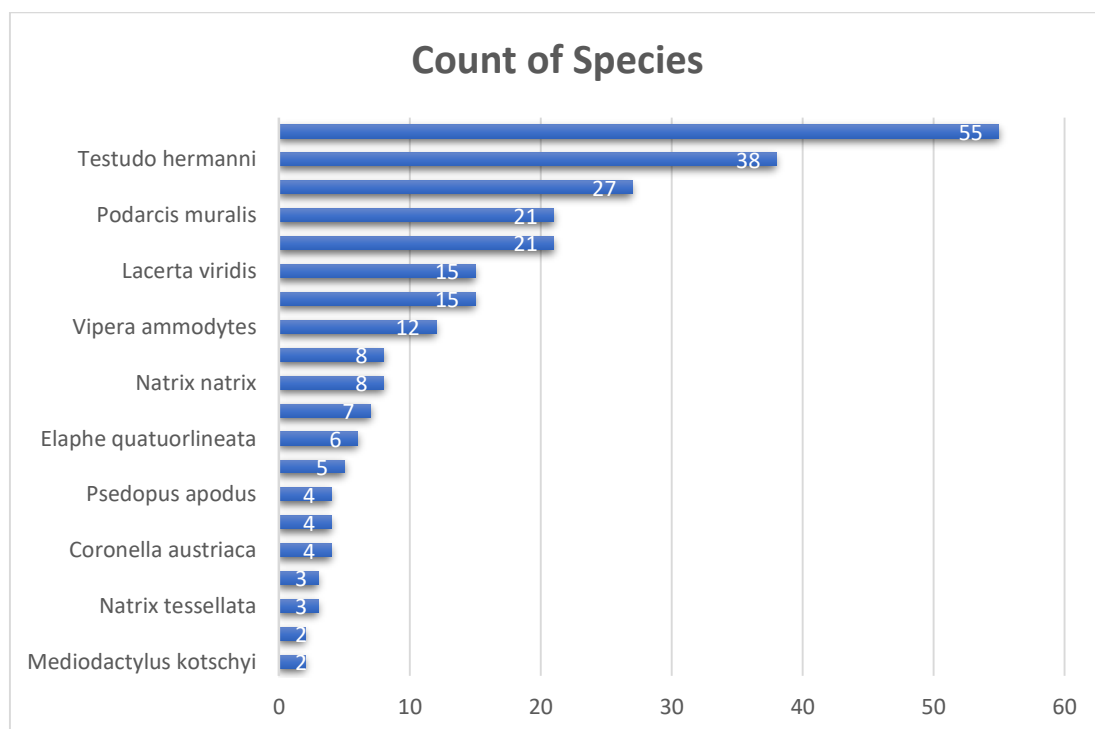


Figure 57: Species records

The most common reptile species is P.erhardii, along with T.hermannii, with 55 and 38 records accordingly. L.trilineata, P.muralis, D.caspius, L. viridis, A.fragilis and V.ammodytes are taxa occurring with moderate frequency, represented by 27, 21, 21, 15, 15 and 12 respectively, as rendered on the chart above (Fig. 58). The other species were represented by less than 10 records in all field surveys.

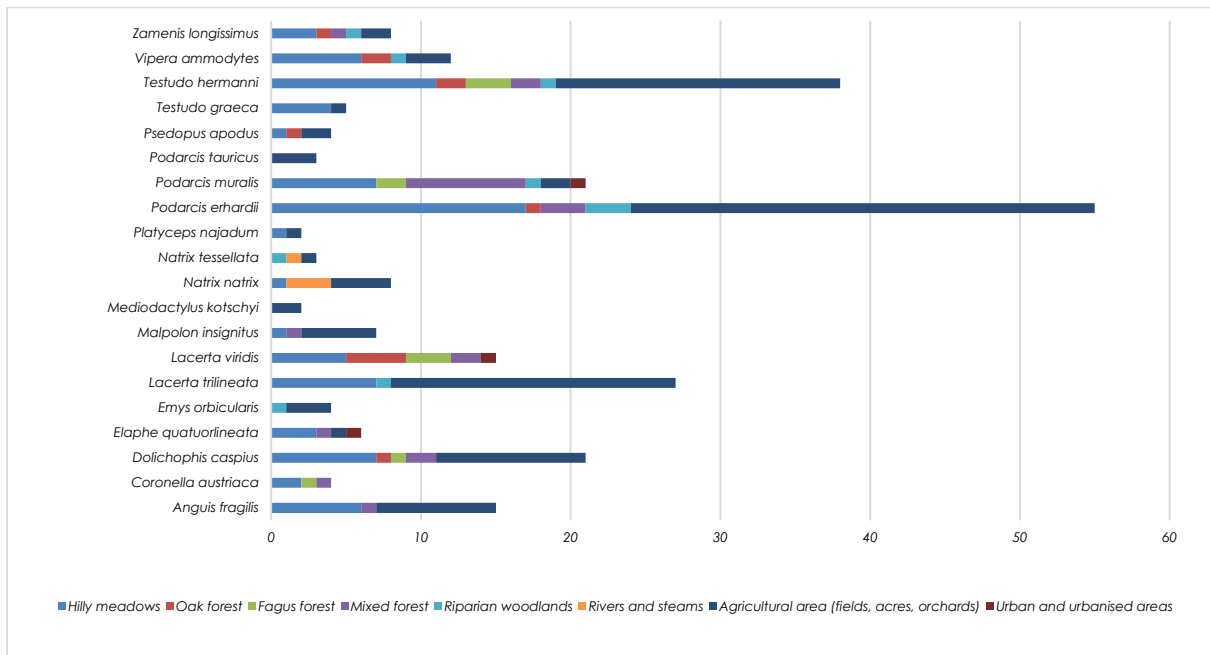


Figure 58: Species records by habitats

The situation with habitat preferences regarding reptiles is similar to the situation of the amphibian group. The agricultural area is the most preferred habitat for the species *T.hermannii*, *P.erhardii*, *L.trilineata* and *D.caspicus*. Hilly meadows are a habitat preferred by *T.hermannii*, *P.erhardii*, *P.muralis*, *L.trilineata* and *V.ammodytes* (Fig. 59).



Figure 59: Hilly meadows in the project area near Dren village.

It is worth noting that this conclusion is drawn based on the data assembled during field surveys. The increased number of specimens of a certain species within the above-mentioned habitats is due to the greater availability of resources of food in agricultural areas compared to other habitats, and because it is easier to be preyed on.



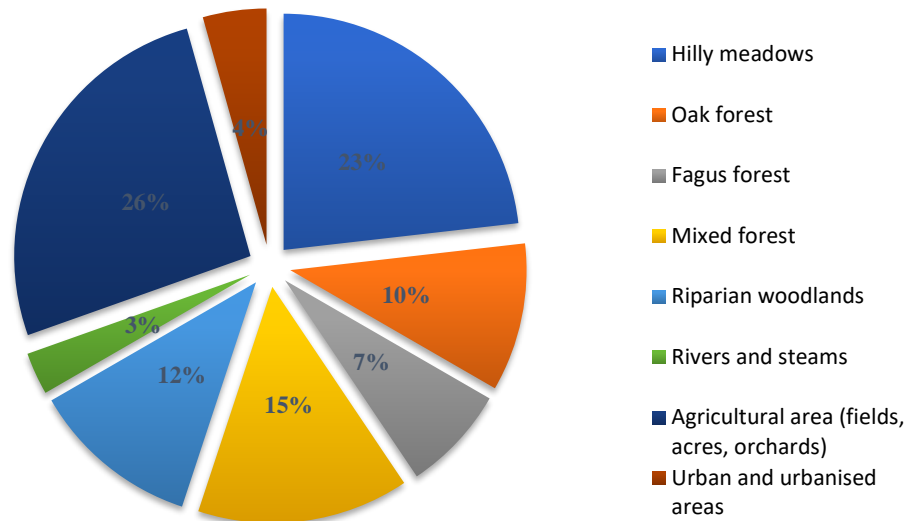


Figure 60: Percentage of reptile species by habitat

Agricultural areas are the most preferable habitat for reptiles with diversity of 18 species, and hilly meadows are the second preferable habitat with 16 species. The habitats that follow are mixed forest (unlike amphibians, the current class prefers this habitat type), riparian woodlands, oak forest, beech forests (figure.61), urban and urbanized areas and rivers and streams.



Figure 61: Hidden dweller of beech forest, *Zamenis longissimus*.

### Valorization

Identical to amphibians, the valorization of reptiles was conducted pursuant to the national and international conventions and legislation on protection of threatened species on national, European or global level. They are as follows: National Red List of Threatened Amphibians; IUCN Global Red List; IUCN European Red List; Habitats Directive Annex II, Annex IV and Annex V; Bern Convention – Conservation of European Wildlife and Natural Habitats; CITES Convention - Convention on International Trade in Endangered Species; List of Strictly Protected and Protected Wild Species (MOEPP 2011); Endemism (Tab. 14).

Table 14. Valorization of reptiles in the pipeline corridor area.

Reptiles		National Red Lists	IUCN Global (2020-2)	IUCN EU (2020-2)	Habitat Directive (Annex II, IV, V)	Bern Convention (Appendix II, III)	CITES (Appendix II)	List of Strictly Protected and Protected Wild Species	Endemism	PBF/CH
1	<i>Testudo hermanni</i>	VU	NT	NT	II, IV	II	II	Protected	/	PBF
2	<i>Testudo graeca</i>	VU	VU	VU	II, IV	II	II	Protected		PBF
3	<i>Emys orbicularis</i>	VU	NT	NT	II, IV	II	/	Protected		PBF
4	<i>Anguis fragilis</i>	LC	LC	/	/	III	/	/	/	/
5	<i>Pseudopus apodus</i>	LC	LC	VU	IV	II	/	Protected		
6	<i>Lacerta trilineata</i>	LC	LC	LC	IV	II	/	Protected	/	/
7	<i>Lacerta viridis</i>	LC	LC	LC	IV	II	/	Protected	/	/
8	<i>Podarcis muralis</i>	LC	LC	LC	IV	II	/	Protected	/	/
9	<i>Podarcis erhardii</i>	LC	LC	LC	IV	II	/	Protected	*	
10	<i>Podarcis tauricus</i>	NT	LC	LC	IV	II	/	/	/	
11	<i>Mediodactylus kotschy</i>	LC	LC	NT	IV	II	/	Protected	/	
12	<i>Dolichophis caspius</i>	LC	LC	LC	IV	II	/	Protected	/	/
13	<i>Coronella austriaca</i>	LC	LC	LC	IV	II	/	Protected	/	/
14	<i>Zamenis longissimus</i>	LC	LC	LC	IV	II	/	Protected	/	/
15	<i>Elaphe quatuorlineata</i>	NT	NT	NT	II, IV	II	/	Protected		
16	<i>Platycephalus najadum</i>	LC	LC	NT	IV	II	/	Protected	/	
17	<i>Malpolon insignitus</i>	LC	LC	NT	/	III	/	/		
18	<i>Natrix natrix</i>	LC	LC	LC	/	III	/	/	/	/
19	<i>Natrix tessellata</i>	LC	LC	LC	IV	II	/	Protected	/	/
20	<i>Vipera ammodytes</i>	LC	LC	LC	IV	II	/	Protected	/	/

\* According to Sindaco & Jeremčenko (2008) and Crochet & Dubois (2004) in terms of distribution this is considered a Balkan endemic

As stated in Tab. 14, the analysis of valorisation of reptiles in the pipeline area renders a rather different situation regarding the national and international conventions and regulations. The following is evident from the table:

- On the National Red List of Reptiles, there are three species (*T.hermanni*, *T.graeca* and *E.orbicularis*) assessed as vulnerable (VU); two species (*P.tauricus* and *E.quatuorlineata*) are considered as near threatened (NT); all other species are categorized as least concern (LC).

- According to the IUCN Global Red List of Threatened Species, three species (*T.hermannii*, *E.orbicularis* and *E.quatuorlineata*) are considered near threatened (NT). All other species are categorized as least concern (LC).
- Identical categorization to the one in the IUCN Global Red List of Threatened Species is applied in the IUCN European Red List of Threatened Species bar one species (*A.fragilis*), which is not categorized. Two species (*P.tauricus* and *E.quatuorlineata*) are considered as near threatened (NT).
- In the EU Habitat Directive, four species (*T.graeca*, *T.hermannii*, *E.orbicularis* and *E.quatuorlineata*) are listed in Annex II while all species are listed on the Annex IV except for the species *A.fragilis*, *M.insignitus* and *N.natrix*.
- In Bern Convention, all are listed in Appendix II while three species are listed in Appendix III (*A.fragilis*, *M.insignitus* and *N.natrix*).
- Two species (*T.graeca* and *T.hermannii*) are in Appendix II of the CITES List.
- All reptile species are on the List of Strictly Protected and Protected Wild Species as protected ones, with the exception of four species – *A.fragilis*, *P.tauricus*, *M.insignitus* and *N.natrix*.

## Birds

### Introduction

There are only few published data from the pipeline corridor in ornithological articles. Notably, Škorpíková et al. 2009 report a breeding colony of the little and common terns *Sternula albifrons* and *Sterna hirundo* on a river island in the river Vardar near Gjavato v. (Gevgelija), Škorpíková et al. 2012, report presence of the Sardinian warbler *Curruca melanocephala* in the kermes oak vegetation near Gjavato, and Petrov 2015 reported presence of a flock of flamingoes *Phoenicopterus roseus* near Bogorodica v.. Veleviski et al. 2010 summarised data of internationally important bird species to identify two Important Bird Areas through which the pipeline corridor passes (IBA Tikvesh Region and IBA Southern Vardar), and another one in which one of the alternatives passes marginally (IBA Demir Kapija Gorge). Summarized data were provided on the species that meet the criteria for identification of IBAs. Additional data were found in the specialised reports on birds for the windfarms Gevgelija (DekonsEma, 2009) and Dren (Empiria EMS and Clean Energy Solutions, 2019). Additional data, where precise enough, were provided from online platforms for observation of wildlife, notably e-bird (<https://ebird.org/home>).

### Methodology

The bird fauna was surveyed along several stretches of the gas pipeline, in a radius of 1-2 km from the projected alignment. Birds were surveyed along transects and from points, mapping the exact locations of the important species. Breeding sites of raptors were visited, coupled with known colonies of species triggering IBA criteria (e.g. the lesser kestrel *Falco naumanni*). Earlier data of the author were also used. The author's list counts 173 species, and additional 13 were added from the literature sources. The estimated abundance of the more important species (listed on the red lists or in Annex I to the Bird Directive) has been provided herewith on the basis of earlier experience about bird densities in the same habitat types.

### Results of Field Study Sites

Table 15: List of Species Recorded in the Pipeline Corridor. Abbreviations: Stat. – resident; Aest. – migratory breeder; Trans. – Migratory; Hiem. – Wintering.

Species	Seasonal Presence	IUCN GRL	IUCN ERL	Bird Directive
<i>Cygnus olor</i>	TRANS	LC	LC	Annex II/B
<i>Anser anser</i>	TRANS	LC	LC	Annexes II/A & III/B
<i>Anser albifrons</i>	TRANS	LC	LC	Annexes II/B & III/B
<i>Tadorna tadorna</i>	TRANS	LC	LC	Not included
<i>Aythya nyroca</i>	TRANS	NT	LC	Annex I

Species	Seasonal Presence	IUCN GRL	IUCN ERL	Bird Directive
<i>Spatula querquedula</i>	TRANS	LC	LC	Annex II/A
<i>Spatula clypeata</i>	TRANS	LC	LC	Annexes II/A & III/B
<i>Mareca strepera</i>	TRANS	LC	LC	Annex II/A
<i>Mareca penelope</i>	TRANS	LC	LC	Annexes II/A & III/B
<i>Anas platyrhynchos</i>	STAT	LC	LC	Annexes II/A & III/A
<i>Anas acuta</i>	TRANS	LC	VU	Annexes II/A & III/B
<i>Anas crecca</i>	TRANS	LC	LC	Annexes II/A & III/B
<i>Coturnix coturnix</i>	AEST	LC	NT	Annex II/B
<i>Alectoris graeca</i>	STAT	NT	NT	Annexes I & II/A
<i>Perdix perdix</i>	STAT	LC	LC	Annexes II/A & III/A
<i>Phoenicopterus roseus</i>	TRANS	LC	LC	Annex I
<i>Tachybaptus ruficollis</i>	TRANS	LC	LC	Not included
<i>Podiceps nigricollis</i>	TRANS	LC	VU	Not included
<i>Columba livia</i>	STAT	LC	LC	Annex II/A
<i>Columba palumbus</i>	STAT	LC	LC	Annexes II/A & III/A
<i>Streptopelia turtur</i>	AEST	VU	VU	Annex II/B
<i>Streptopelia decaocto</i>	STAT	LC	LC	Annex II/B
<i>Caprimulgus europaeus</i>	AEST	LC	LC	Annex I
<i>Tachymarptis melba</i>	AEST	LC	LC	Not included
<i>Apus pallidus</i>	AEST	LC	LC	Not included
<i>Apus apus</i>	AEST	LC	NT	Not included
<i>Cuculus canorus</i>	AEST	LC	LC	Not included
<i>Rallus aquaticus</i>	STAT	LC	LC	Annex II/B
<i>Gallinula chloropus</i>	STAT	LC	LC	Annex II/B
<i>Ciconia nigra</i>	AEST	LC	LC	Annex I
<i>Ciconia ciconia</i>	AEST	LC	LC	Annex I
<i>Pelecanus crispus</i>	TRANS	NT	LC	Annex I
<i>Ixobrychus minutus</i>	AEST	LC	LC	Annex I



Species	Seasonal Presence	IUCN GRL	IUCN ERL	Bird Directive
<i>Nycticorax nycticorax</i>	TRANS	LC	LC	Annex I
<i>Ardeola ralloides</i>	TRANS	LC	LC	Annex I
<i>Ardea cinerea</i>	STAT	LC	LC	Not included
<i>Ardea purpurea</i>	TRANS	LC	LC	Annex I
<i>Ardea alba</i>	HIEM	LC	LC	Annex I
<i>Egretta garzetta</i>	TRANS	LC	LC	Annex I
<i>Platalea leucorodia</i>	TRANS	LC	LC	Annex I
<i>Microcarbo pygmaeus</i>	TRANS	LC	LC	Annex I
<i>Phalacrocorax carbo</i>	TRANS	LC	LC	Not included
<i>Charadrius dubius</i>	AEST	LC	LC	Not included
<i>Vanellus vanellus</i>	TRANS	NT	VU	Annex II/B
<i>Calidris pugnax</i>	TRANS	LC	NT	Annexes I & II/B
<i>Calidris minuta</i>	TRANS	LC	LC	Not included
<i>Scolopax rusticola</i>	HIEM	LC	LC	Annexes II/A & III/B
<i>Gallinago gallinago</i>	HIEM	LC	VU	Annexes II/A & III/B
<i>Actitis hypoleucos</i>	TRANS	LC	LC	Not included
<i>Tringa ochropus</i>	TRANS	LC	LC	Not included
<i>Tringa nebularia</i>	TRANS	LC	LC	Annex II/B
<i>Tringa glareola</i>	TRANS	LC	LC	Annex I
<i>Chroicocephalus ridibundus</i>	TRANS	LC	LC	Annex II/B
<i>Larus michahellis</i>	AEST	LC	LC	Annex II/B
<i>Sternula albifrons</i>	AEST	LC	LC	Annex I
<i>Gelochelidon nilotica</i>	TRANS	LC	LC	Annex I
<i>Sterna hirundo</i>	AEST	LC	LC	Annex I
<i>Pandion haliaetus</i>	TRANS	LC	LC	Annex I
<i>Pernis apivorus</i>	AEST	LC	LC	Annex I
<i>Neophron percnopterus</i>	AEST	EN	VU	Annex I
<i>Circaetus gallicus</i>	AEST	LC	LC	Annex I

Species	Seasonal Presence	IUCN GRL	IUCN ERL	Bird Directive
<i>Gyps fulvus</i>	STAT	LC	LC	Annex I
<i>Aquila heliaca</i>	STAT	VU	LC	Annex I
<i>Aquila chrysaetos</i>	STAT	LC	LC	Annex I
<i>Hieraaetus pennatus</i>	AEST	LC	LC	Annex I
<i>Circus aeruginosus</i>	HIEM	LC	LC	Annex I
<i>Circus cyaneus</i>	TRANS	LC	LC	Annex I
<i>Circus pygargus</i>	AEST	LC	LC	Annex I
<i>Accipiter brevipes</i>	AEST	LC	LC	Annex I
<i>Accipiter nisus</i>	STAT	LC	LC	Not included
<i>Accipiter gentilis</i>	STAT	LC	LC	Not included
<i>Milvus migrans</i>	AEST	LC	LC	Annex I
<i>Buteo buteo</i>	STAT	LC	LC	Not included
<i>Buteo rufinus</i>	STAT	LC	LC	Annex I
<i>Athene noctua</i>	STAT	LC	LC	Not included
<i>Otus scops</i>	AEST	LC	LC	Not included
<i>Strix aluco</i>	STAT	LC	LC	Not included
<i>Bubo bubo</i>	STAT	LC	LC	Annex I
<i>Upupa epops</i>	AEST	LC	LC	Not included
<i>Picus canus</i>	HIEM	LC	LC	Annex I
<i>Picus viridis</i>	STAT	LC	LC	Not included
<i>Dryocopus martius</i>	HIEM	LC	LC	Annex I
<i>Dendrocopos minor</i>	STAT	LC	LC	Not included
<i>Dendrocopos medius</i>	STAT	LC	LC	Annex I
<i>Dendrocopos syriacus</i>	STAT	LC	LC	Annex I
<i>Dendrocopos major</i>	STAT	LC	LC	Not included
<i>Merops apiaster</i>	AEST	LC	LC	Not included
<i>Coracias garrulus</i>	STAT	LC	LC	Annex I
<i>Alcedo atthis</i>	STAT	LC	LC	Annex I

Species	Seasonal Presence	IUCN GRL	IUCN ERL	Bird Directive
<i>Falco naumanni</i>	AEST	LC	LC	Annex I
<i>Falco tinnunculus</i>	STAT	LC	LC	Not included
<i>Falco vespertinus</i>	TRANS	NT	VU	Annex I
<i>Falco subbuteo</i>	AEST	LC	LC	Not included
<i>Falco peregrinus</i>	STAT	LC	LC	Annex I
<i>Oriolus oriolus</i>	AEST	LC	LC	Not included
<i>Lanius collurio</i>	AEST	LC	LC	Annex I
<i>Lanius minor</i>	AEST	LC	LC	Annex I
<i>Lanius excubitor</i>	HIEM	LC	LC	Not included
<i>Lanius senator</i>	AEST	LC	NT	Not included
<i>Pyrrhocorax graculus</i>	HIEM	LC	LC	Not included
<i>Garrulus glandarius</i>	STAT	LC	LC	Annex II/B
<i>Pica pica</i>	STAT	LC	LC	Annex II/B
<i>Corvus monedula</i>	STAT	LC	LC	Annex II/B
<i>Corvus corax</i>	STAT	LC	LC	Not included
<i>Corvus corone</i>	STAT	LC	LC	Annex II/B
<i>Passer domesticus</i>	STAT	LC	LC	Not included
<i>Passer hispaniolensis</i>	STAT	LC	LC	Not included
<i>Passer montanus</i>	STAT	LC	LC	Not included
<i>Anthus trivialis</i>	AEST	LC	LC	Not included
<i>Anthus pratensis</i>	TRANS	NT	LC	Not included
<i>Anthus spinoletta</i>	HIEM	LC	LC	Not included
<i>Anthus campestris</i>	TRANS	LC	LC	Annex I
<i>Motacilla flava</i>	AEST	LC	LC	Not included
<i>Motacilla cinerea</i>	STAT	LC	LC	Not included
<i>Motacilla alba</i>	STAT	LC	LC	Not included
<i>Fringilla coelebs</i>	STAT	LC	LC	Not included
<i>Fringilla montifringilla</i>	HIEM	LC	LC	Not included

Species	Seasonal Presence	IUCN GRL	IUCN ERL	Bird Directive
<i>Coccothraustes coccothraustes</i>	STAT	LC	LC	Not included
<i>Pyrrhula pyrrhula</i>	HIEM	LC	LC	Not included
<i>Chloris chloris</i>	STAT	LC	LC	Not included
<i>Linaria cannabina</i>	STAT	LC	LC	Not included
<i>Carduelis carduelis</i>	STAT	LC	LC	Not included
<i>Serinus serinus</i>	HIEM	LC	LC	Not included
<i>Spinus spinus</i>	HIEM	LC	LC	Not included
<i>Granativora melanocephala</i>	AEST	LC	LC	Not included
<i>Emberiza calandra</i>	STAT	LC	LC	Not included
<i>Emberiza cia</i>	STAT	LC	LC	Not included
<i>Emberiza hortulana</i>	AEST	LC	LC	Annex I
<i>Emberiza cirrus</i>	STAT	LC	LC	Not included
<i>Emberiza citrinella</i>	HIEM	LC	LC	Not included
<i>Schoeniclus schoeniclus</i>	STAT	LC	LC	Not included
<i>Poecile lugubris</i>	STAT	LC	LC	Not included
<i>Poecile palustris</i>	STAT	LC	LC	Not included
<i>Cyanistes caeruleus</i>	STAT	LC	LC	Not included
<i>Parus major</i>	STAT	LC	LC	Not included
<i>Remiz pendulinus</i>	STAT	LC	LC	Not included
<i>Melanocorypha calandra</i>	STAT	LC	LC	Annex I
<i>Calandrella brachydactyla</i>	AEST	LC	LC	Annex I
<i>Lullula arborea</i>	STAT	LC	LC	Annex I
<i>Alauda arvensis</i>	STAT	LC	LC	Annex II/B
<i>Galerida cristata</i>	STAT	LC	LC	Not included
<i>Iduna pallida</i>	AEST	LC	LC	Not included
<i>Acrocephalus arundinaceus</i>	AEST	LC	LC	Not included
<i>Delichon urbicum</i>	AEST	LC	LC	Not included
<i>Cecropis daurica</i>	AEST	LC	LC	Not included



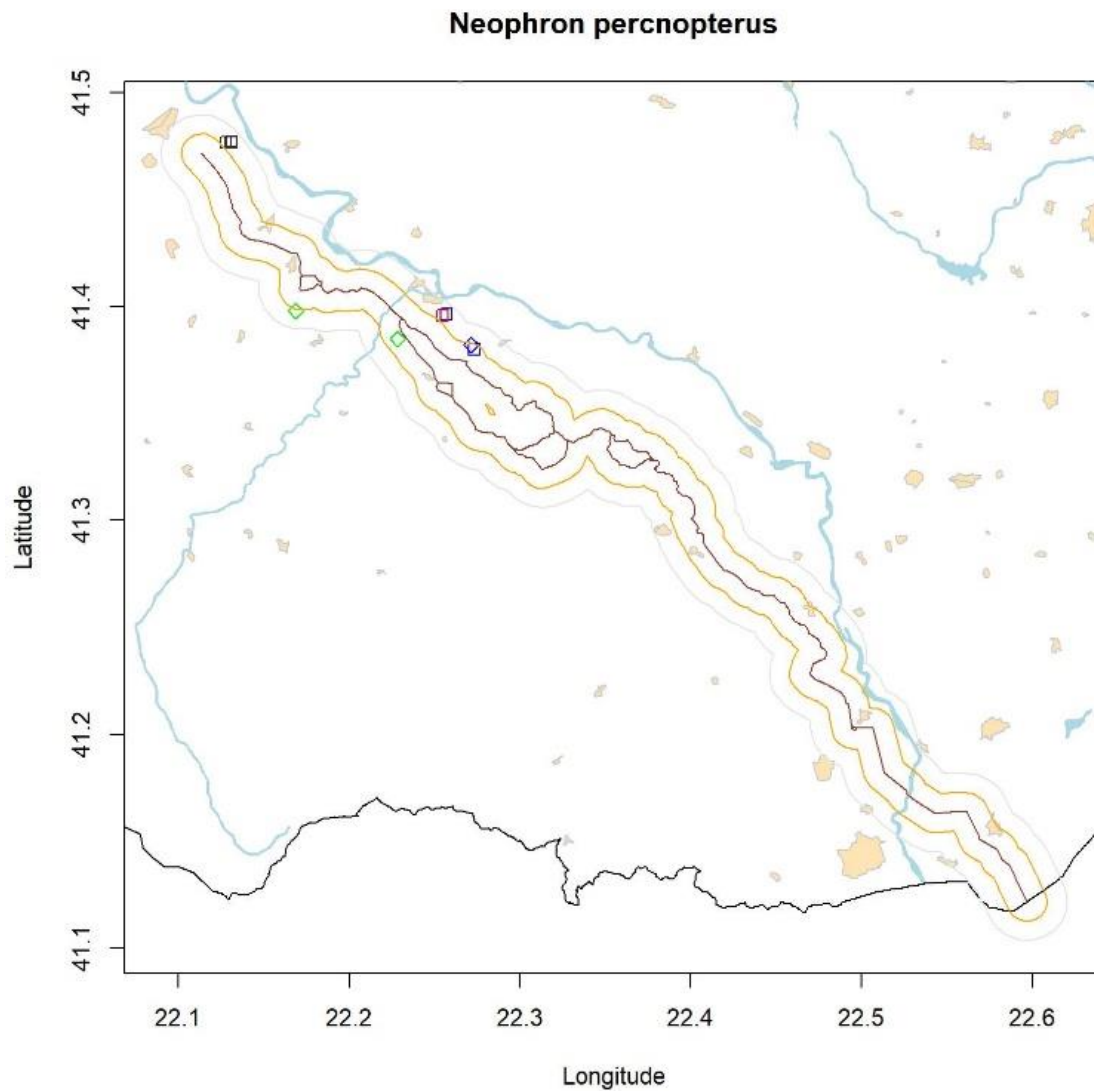
Species	Seasonal Presence	IUCN GRL	IUCN ERL	Bird Directive
<i>Hirundo rustica</i>	AEST	LC	LC	Not included
<i>Ptyonoprogne rupestris</i>	AEST	LC	LC	Not included
<i>Riparia riparia</i>	AEST	LC	LC	Not included
<i>Rhadina sibilatrix</i>	TRANS	LC	LC	Not included
<i>Phylloscopus trochilus</i>	TRANS	LC	LC	Not included
<i>Phylloscopus collybita</i>	STAT	LC	LC	Not included
<i>Cettia cetti</i>	STAT	LC	LC	Not included
<i>Aegithalos caudatus</i>	STAT	LC	LC	Not included
<i>Sylvia atricapilla</i>	AEST	LC	LC	Not included
<i>Sylvia borin</i>	AEST	LC	LC	Not included
<i>Curruca nisoria</i>	AEST	LC	LC	Annex I
<i>Curruca crassirostris</i>	AEST	LC	LC	Not included
<i>Curruca curruca</i>	AEST	LC	LC	Not included
<i>Curruca cantillans</i>	AEST	LC	LC	Not included
<i>Curruca melanocephala</i>	STAT	LC	LC	Not included
<i>Curruca communis</i>	AEST	LC	LC	Not included
<i>Regulus regulus</i>	HIEM	LC	LC	Not included
<i>Regulus ignicapilla</i>	HIEM	LC	LC	Not included
<i>Certhia brachydactyla</i>	STAT	LC	LC	Not included
<i>Certhia familiaris</i>	HIEM	LC	LC	Not included
<i>Sitta europaea</i>	STAT	LC	LC	Not included
<i>Sitta neumayer</i>	STAT	LC	LC	Not included
<i>Troglodytes troglodytes</i>	STAT	LC	LC	Not included
<i>Sturnus vulgaris</i>	STAT	LC	LC	Annex II/B
<i>Muscicapa striata</i>	TRANS	LC	LC	Not included
<i>Erithacus rubecula</i>	STAT	LC	LC	Not included
<i>Luscinia megarhynchos</i>	AEST	LC	LC	Not included
<i>Ficedula parva</i>	TRANS	LC	LC	Annex I

Species	Seasonal Presence	IUCN GRL	IUCN ERL	Bird Directive
<i>Ficedula hypoleuca</i>	TRANS	LC	LC	Not included
<i>Ficedula albicollis</i>	TRANS	LC	LC	Annex I
<i>Phoenicurus phoenicurus</i>	TRANS	LC	LC	Not included
<i>Phoenicurus ochruros</i>	STAT	LC	LC	Not included
<i>Monticola solitarius</i>	AEST	LC	LC	Not included
<i>Saxicola rubetra</i>	TRANS	LC	LC	Not included
<i>Oenanthe Oenanthe</i>	AEST	LC	LC	Not included
<i>Oenanthe hispanica</i>	AEST	LC	LC	Not included
<i>Turdus viscivorus</i>	STAT	LC	LC	Annex II/B
<i>Turdus philomelos</i>	STAT	LC	LC	Annex II/B
<i>Turdus iliacus</i>	HIEM	NT	LC	Annex II/B
<i>Turdus merula</i>	STAT	LC	LC	Annex II/B
<i>Turdus pilaris</i>	HIEM	LC	LC	Annex II/B

**Interpretation of maps:** Stars indicate the most recent data, diamonds and squares - historical data. Green marks indicate possible breeding, blue marks probable breeding, red marks confirmed breeding. Black marks indicate non-breeding birds. The gas pipeline with all alternatives is shown in dark brown, and an axis within 1 km corridor (ochre line) and 2 km corridor (light grey line).

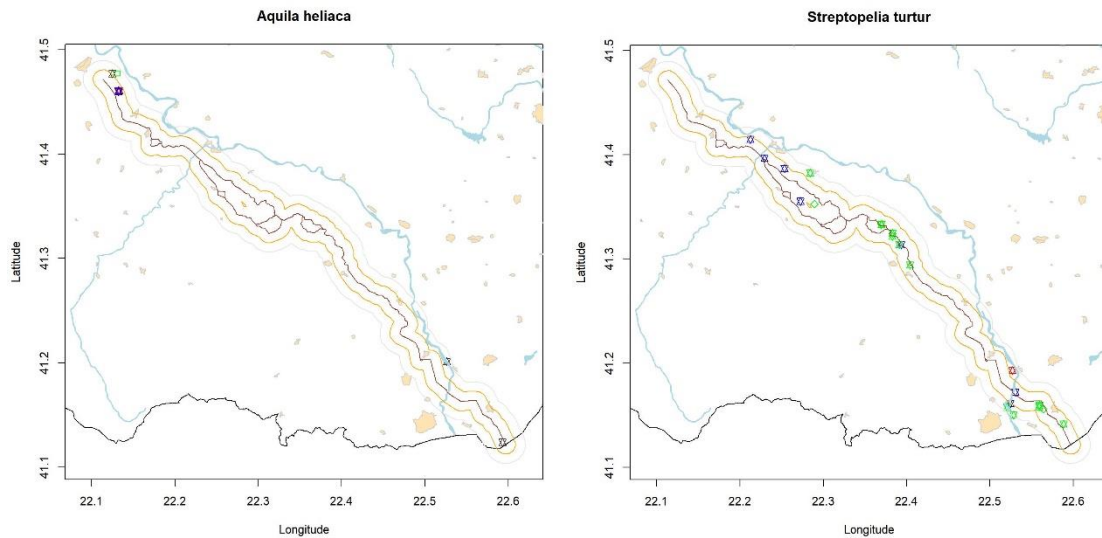
#### **Neophron percnopterus**

One pair of Egyptian vultures has been found breeding in Demir Kapija Gorge, in the wider area of the pipeline (outside the 2 km corridor), but it uses the project area for foraging. **No significant impact is expected on this breeding pair.** Five additional historically known territories are present in the wider region of Demir Kapija, which are now all unoccupied.



### **Aquila heliaca**

One pair of imperial eagles used to breed on a pylon in the vicinity of Negotino (Dubrovo). The pair has not been spotted in the last two years, but it cannot be excluded that it has changed its breeding location and that it might still be present in the region. Non-breeding birds are occasionally observed in the southern parts of the project region, during dispersion/migration. Temporary habitat loss/disturbance is likely to affect breeding birds eventually.

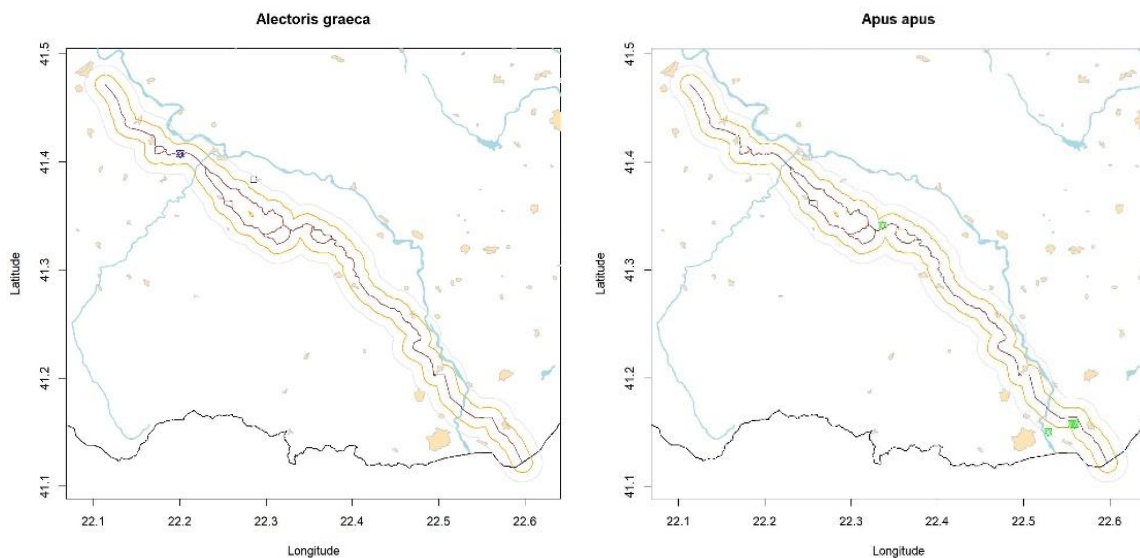


### **Streptopelia turtur**

The turtle dove is a common breeding bird species in the area of interest, with densities from 2 pa/km<sup>2</sup>, but locally reaching up to 7 pa/km<sup>2</sup>. Although point data are shown, it is actually present along the entire pipeline corridor. Although the European population is in steep decline, the Macedonian breeding population still seems stable (or experiencing a smaller decline). It will be affected by habitat loss and disturbance. In the short term, ground clearing will provide new feeding possibilities in the overgrown habitats. *No specific mitigation measures might be implemented.*

### **Alectoris graeca**

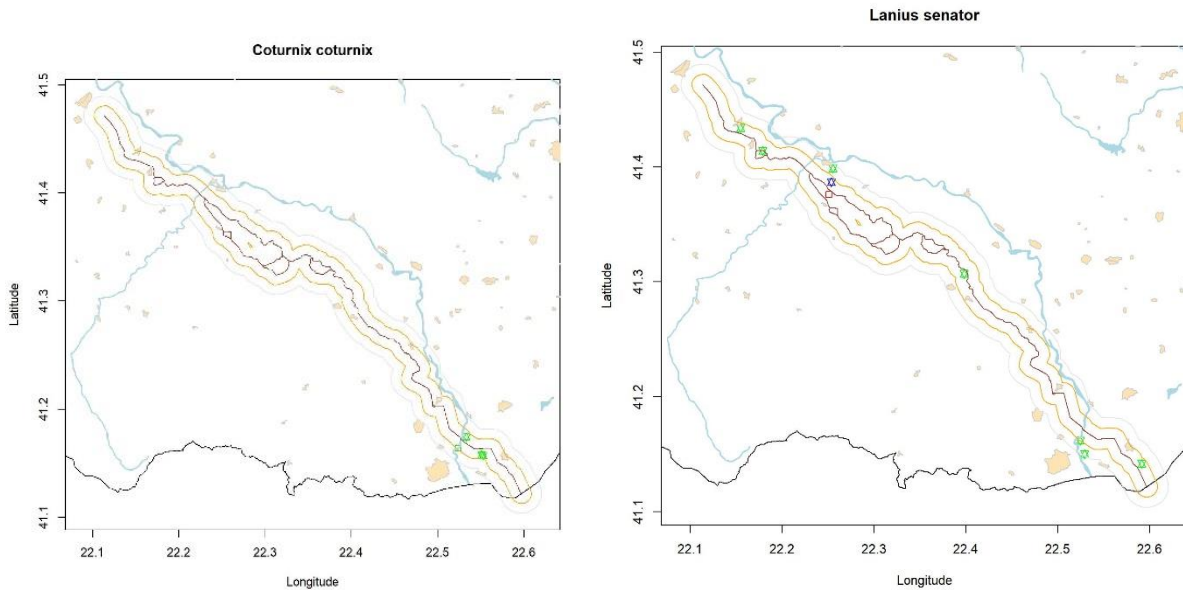
The rock partridge is a common species in rocky and scrubby areas in North Macedonia, and although it has only been sporadically registered in the study area, it should be regarded as more common. The effect from the project implementation will be minor to negligible.



### **Apus apus**

The common swift has declining populations throughout Europe, but its national situation is not well known. It is connected to urban centres for breeding and it is an aerial hunter, and therefore it will not be affected by the project implementation.





### **Coturnix coturnix**

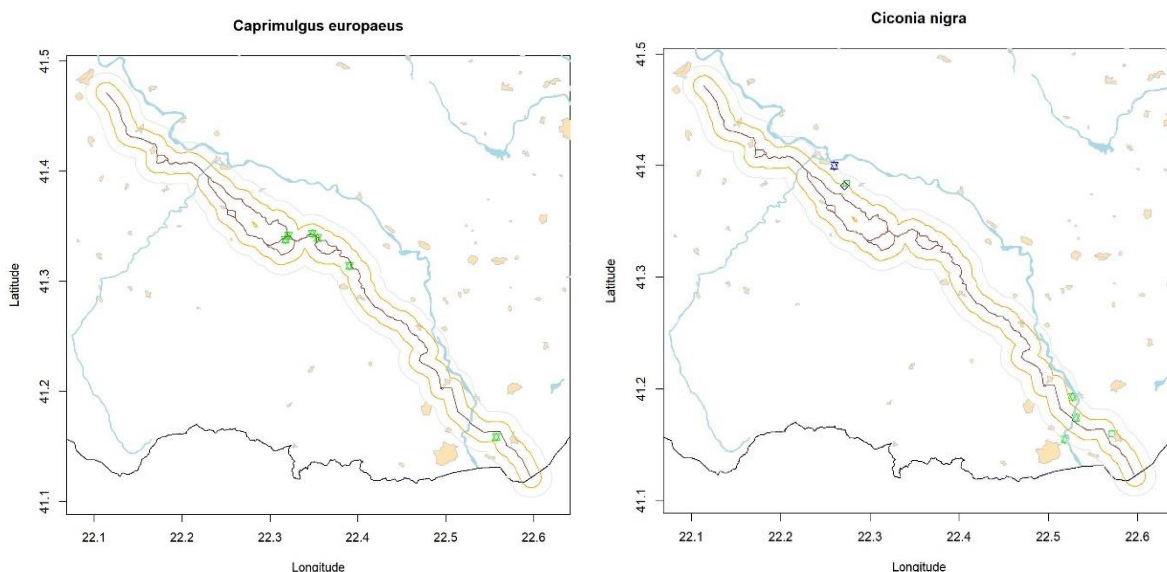
The quail is another species declining in Europe, related to arable land and pastures. It has good populations in the southern part of the project areas (Gevgelija fields), about 2 pa/km<sup>2</sup>, that will be affected by the project implementation. The effects will be temporary, and the population is expected to recover within one-two breeding seasons.

### **Lanius senator**

The woodchat shrike is a common and widespread species in the open woodlands and bushes, and in the arable habitats along the project corridor (reaching 3-4 pa/km<sup>2</sup>) and in the country. The European populations are declining. Although the project implementation will cause temporary habitat loss, the population will recover, and it will benefit from the newly-established open areas along the pipeline.

### **Caprimulgus europaeus**

The nightjar is a common species in the woodland habitats along the pipeline (densities of about 1 pa/km<sup>2</sup>), and its habitat will be affected in the medium term until the surface vegetation is recovered. No specific mitigation measures are possible except for avoidance of construction activities in the breeding period (April-June) so as to minimize disturbance and nest losses, which is a proposed general measure.

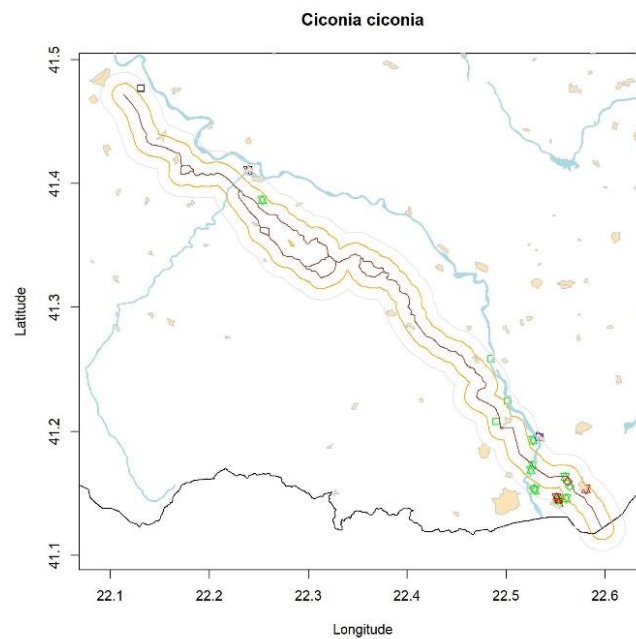


### **Ciconia nigra**

The black stork breeds in Demir Kapija Gorge, and it uses the Vardar river and its tributaries for foraging. During migration it can be expected along the entire corridor. It is highly sensitive to disturbance and habitat loss, but no nest is known in the vicinity of the corridor.

### **Ciconia ciconia**

The white stork is one of the triggering species for identification of the IBA Southern Vardar, and it has good populations in the villages of Bogorodica and Stojakovo in Gevgelija region (about 60 pairs breed in this region, (PutilinStamkoska et al. 2020). The pipeline is foreseen to traverse one of the main feeding areas near Stojakovo (Gevgelija), and there is a risk that the construction will alter the hydrological regime of this wet meadow. Therefore, a slight route change is proposed.



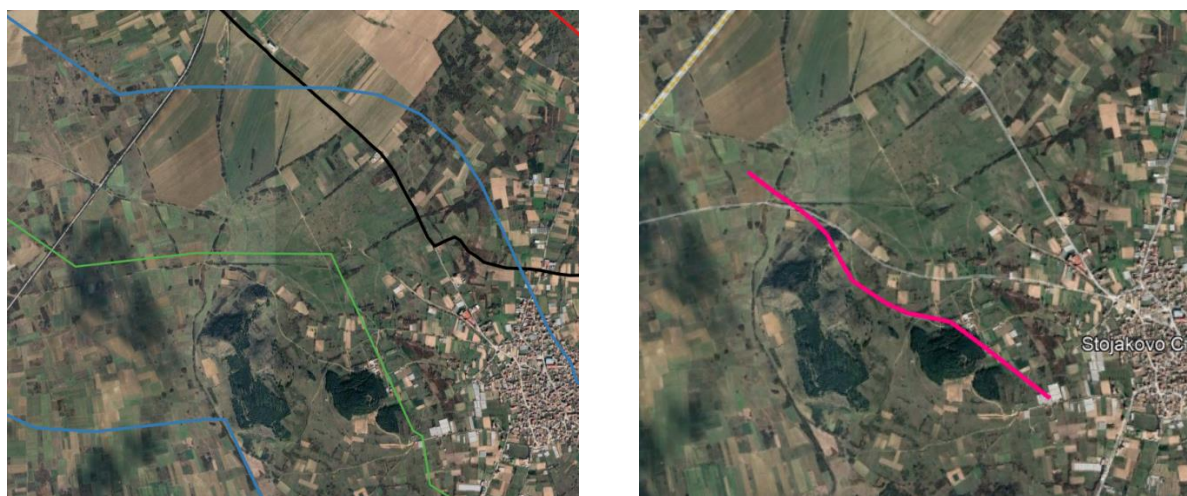
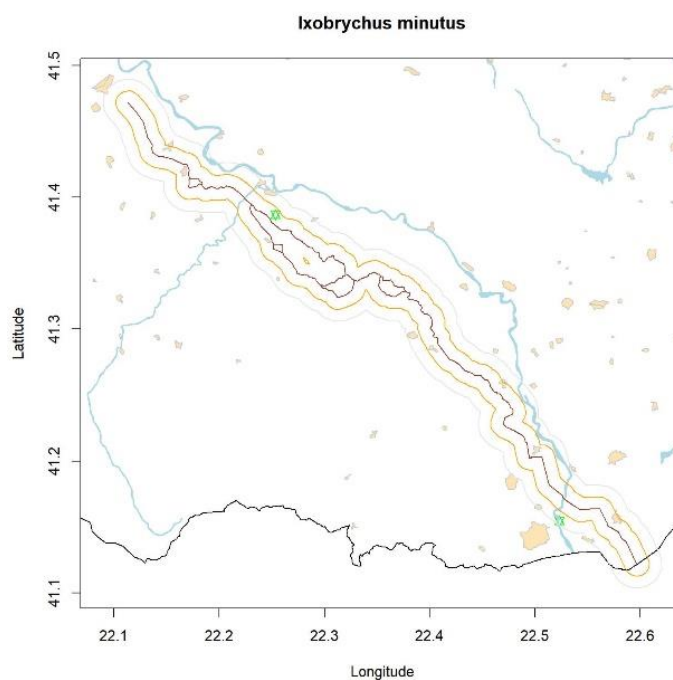


Figure 62: Foreseen (green line, Fig. A) and proposed change (pink line, Fig. B) of the gas pipeline route near Stojakovo village, in order to preserve the foraging habitat of the priority species – the white stork.

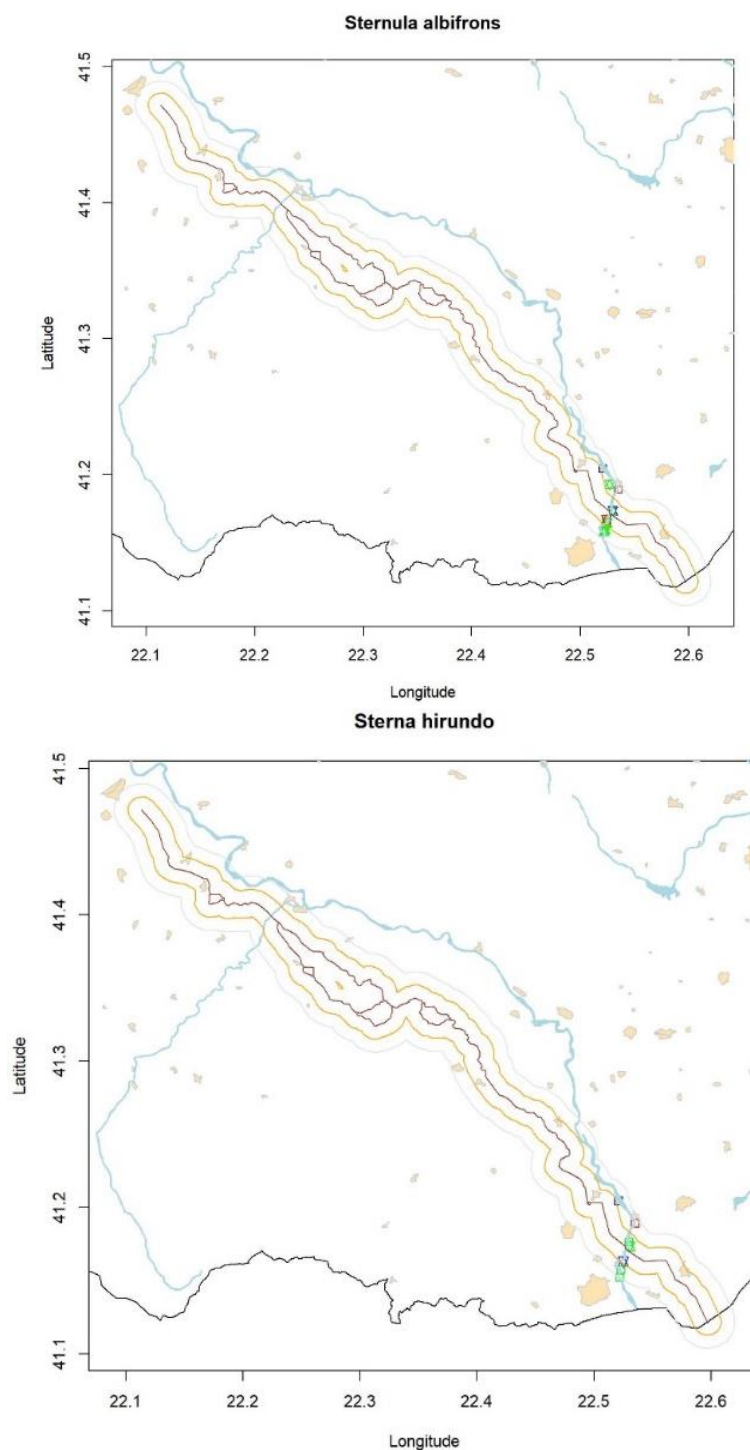
### **Ixobrychus minutus**

A few pairs of the little bitter might be breeding in the sections of the Lower Vardar river where reed-beds exist. It will not be significantly affected by the construction of the pipeline.



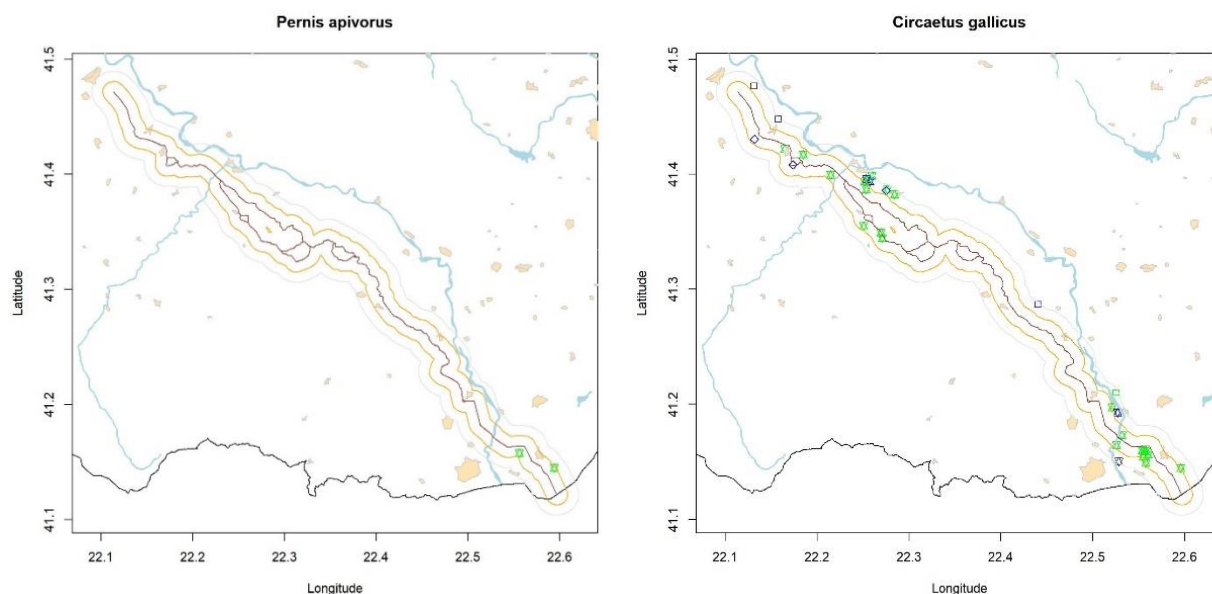
### ***Sternula albifrons* and *Sterna hirundo***

The Lower Vardar region is the only known breeding site for these Annex I species - the little tern and the common tern in North Macedonia; therefore, they will require protection. A mixed colony is located on a small island near Gjavato village, about 2 km from the foreseen project pipeline. The colony is about 30 pairs in total, equally divided between both species. Construction will cause foraging habitat loss and disturbance. Ideally, **construction activities should be implemented in the period between August and March so as to avoid any impact upon the colony.** Breeding on other river islands cannot be excluded. Therefore, no alterations in the river bed are to be made with the construction works.



### **Pernis apivorus**

One pair of the honey buzzard probably breeds in the Lower Vardar region, and it will likely be unaffected by the construction works.

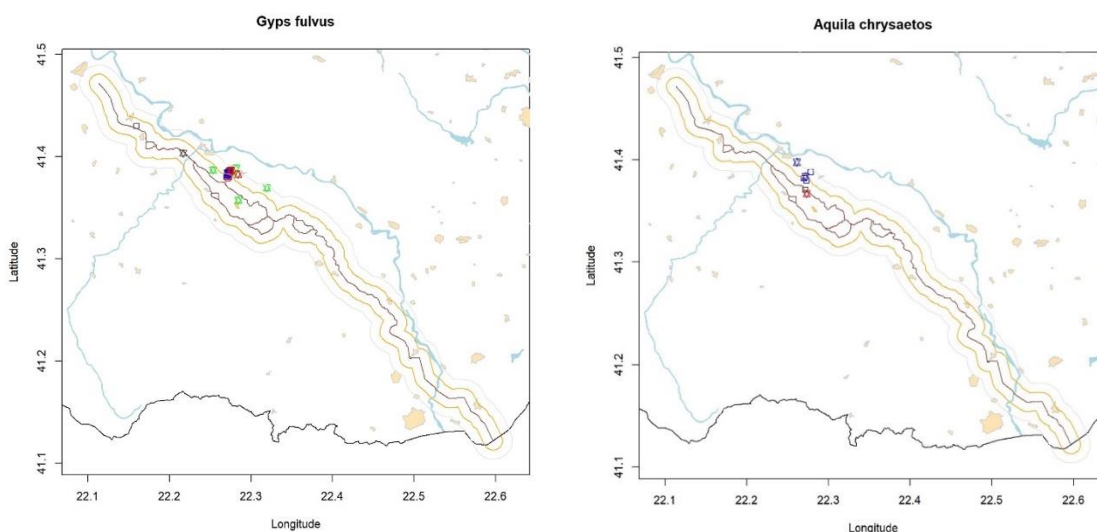


### **Circaetus gallicus**

The short-toed snake-eagle is a common species in the Mediterranean woodland, especially on calcareous substrate, and several pairs (at least five) occur along the project corridor. They will be adversely affected by the pipeline construction, which will cause some disturbance and especially (foraging) habitat loss, which might reflect on the breeding success. These negative effects are expected to be of temporary nature, and they will likely become negligible within several years.

### **Gyps fulvus**

A colony of the griffon vultures exists near the project corridor (above Klisura village, Demir Kapija), and one of the pipeline alternatives passes very close to the colony (at the locality Vrvot). This alternative is to be avoided. Due to the topography of the terrain, the other alternative will not affect the colony. Although birds from the colony rarely use the corridor area for foraging, they will not be significantly affected by habitat loss and disturbance.



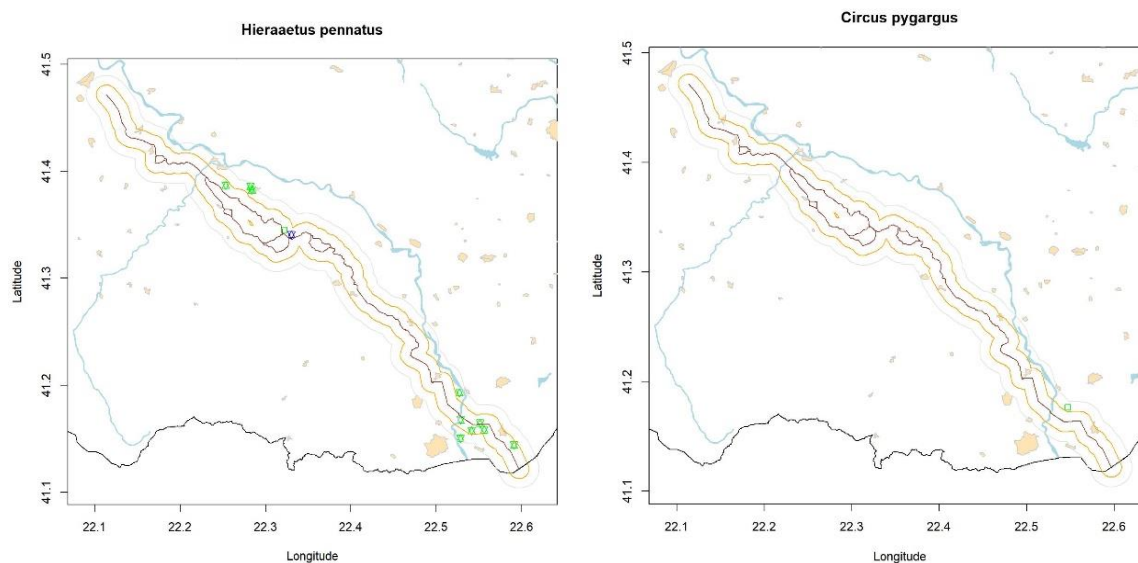


### **Aquila chrysaetos**

An active nest of one pair of the golden eagle occurs along one of the proposed alternatives of the pipeline (at Vrvot), and this alternative should be abandoned. The construction will cause habitat loss and disturbance to this breeding pair, but the effect is expected to be temporary.

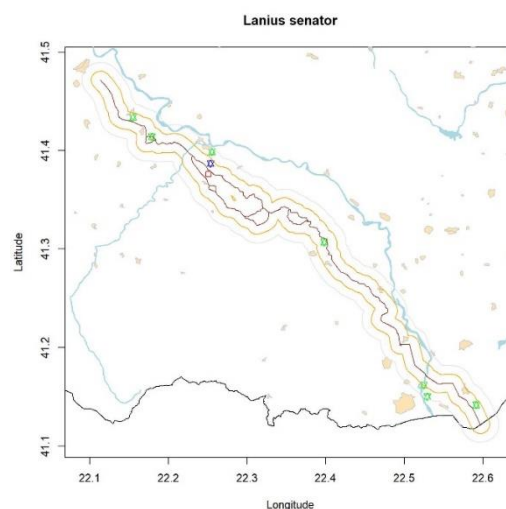
### **Hieraaetus pennatus**

Two to three pairs of the booted eagle should be found in the forests between Dren and Gabrovo villages, and one to two more around Stojakovo village. The construction will cause habitat loss and disturbance to this rare bird of prey, which requires mature forest stands for breeding. Mitigation measures should include avoidance of the forest stands along the corridor, and **avoidance of construction work in the period March 15th – July 31st** in the breeding areas for this species.



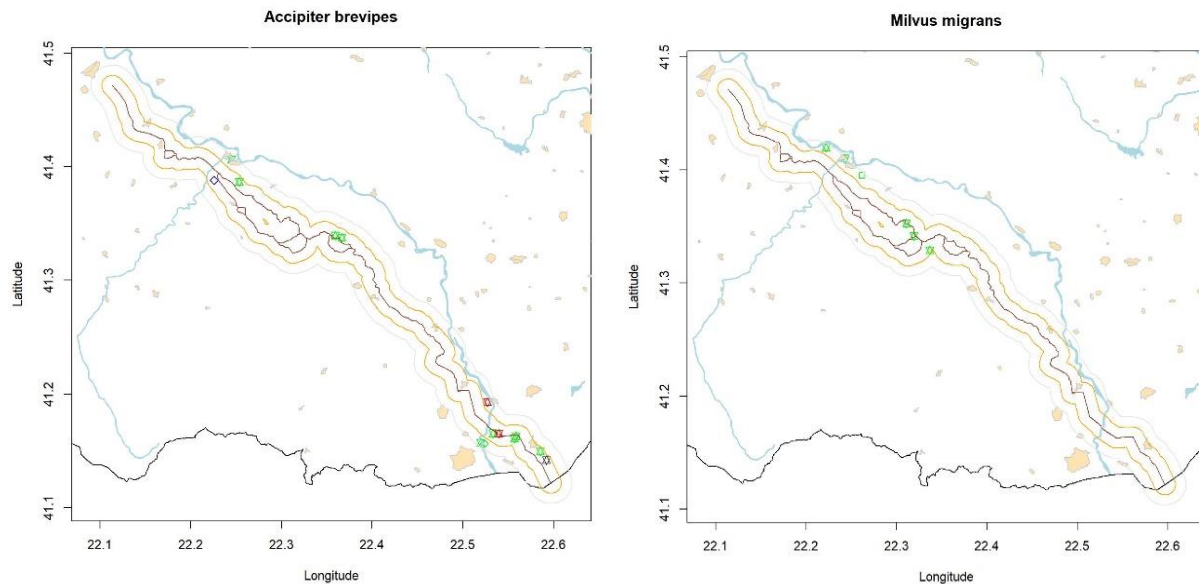
### **Circus pygargus**

One or two pairs of Montagu's harriers breed in the field near Gevgelija, and they will temporarily be affected by the construction work (both disturbance and habitat loss). Under assumption that agriculture habitat will be restored anyway, **avoidance of construction work between May 1st and July 30th** is the only possible mitigation measure.



### **Accipiter brevipes**

The levant sparrowhawk is a typical bird of prey for the Lower Vardar region (both Demir Kapija and Gevgelija), and this area is the core of its population in North Macedonia. The national population is small, possibly no more than 60 pairs. It breeds in the riparian forests, and some pairs will likely be affected by habitat loss and disturbance. Therefore, minimal destruction of the riparian forest should be secured throughout the construction, both along Bosava-Dosnica rivers and at the Lower Vardar.



### **Milvus migrans**

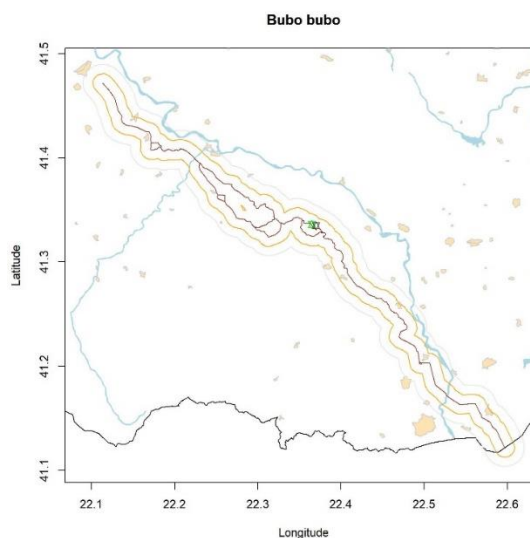
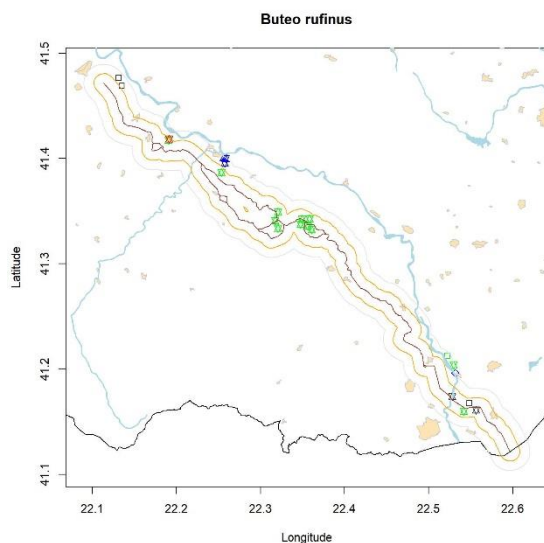
One or two pairs of the extremely rare black kite breed in the wider region of Demir Kapija, but they will unlikely be affected by the project implementation as they are related to the preserved forest stands which are not to be found along the project corridor. Nonetheless, they forage in sections of the pipeline corridor; hence, some negative effect is still expected.

### **Buteo rufinus**

Two to four pairs of the long-legged buzzard are found along the project corridor, but they will unlikely be affected by the project implementation as they benefit from open habitats. Nests are not located near the projected corridor.

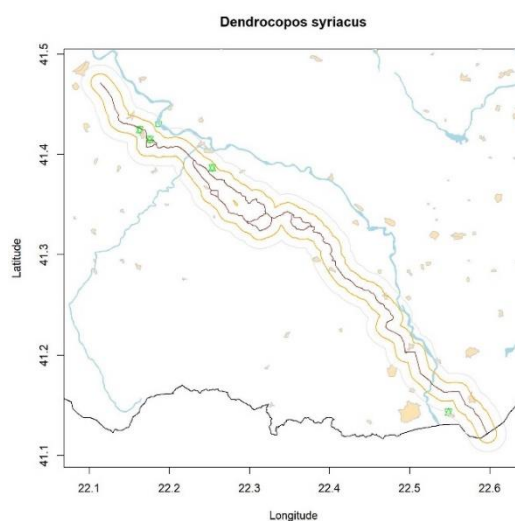
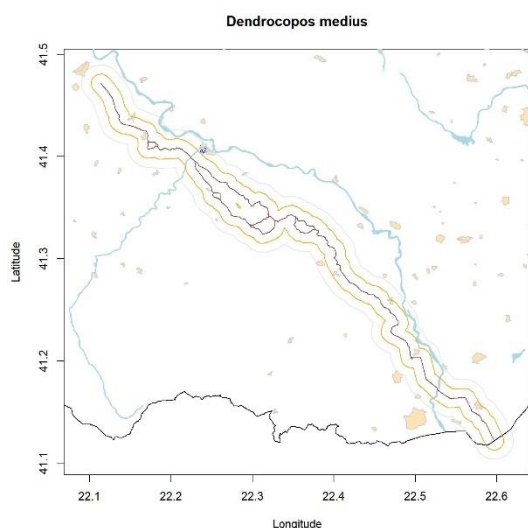
### **Bubo bubo**

At least one territory of the eagle owls is known in the project corridor, but the species is likely more common. Temporary disturbance and habitat loss are expected, but no significant impact in the long term.



### **Dendrocopos medius**

In the study area, the middle-spotted woodpecker is linked to the riparian forests, and it will insignificantly be affected by the project implementation. Its population seems already depleted in the pipeline corridor.

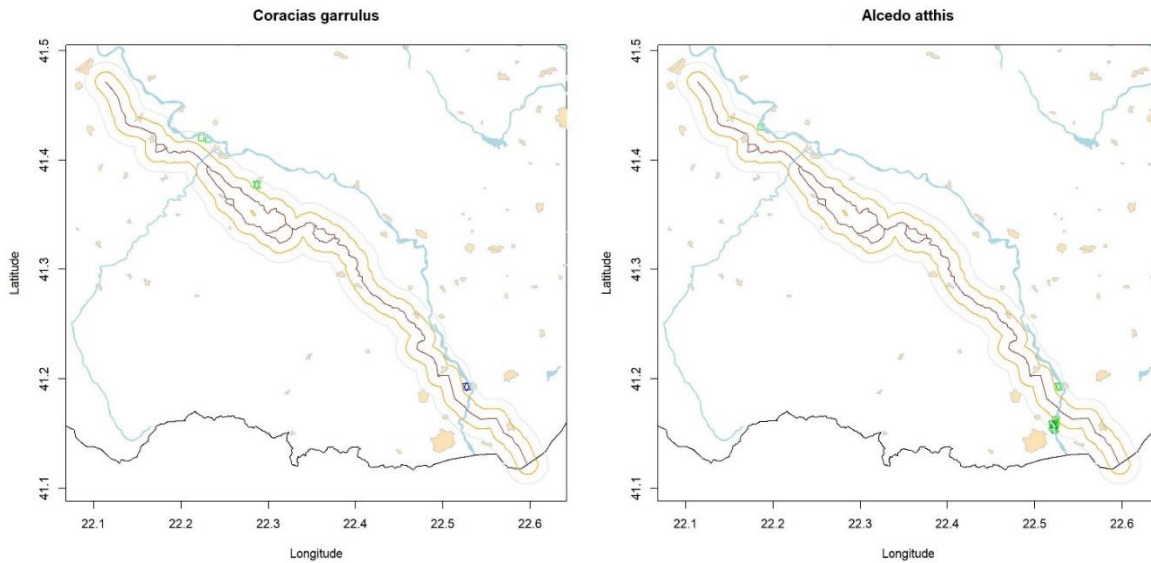


### **Dendrocopos syriacus**

The Syrian woodpecker is connected to orchards, and it is a very common species in North Macedonia. Effects from the project implementation upon its population will be negligible and temporary.

### **Coracias garrulus**

A few pairs of rollers scarcely breed in the riparian forests in the Lower Vardar section. The species might be affected only locally, near Gevgelija, **if large poplar or plane trees are felled** for the sake of project implementation. Therefore, as a mitigation measure, this practice should not be allowed (which will have a positive impact for other species, too).



### **Alcedo atthis**

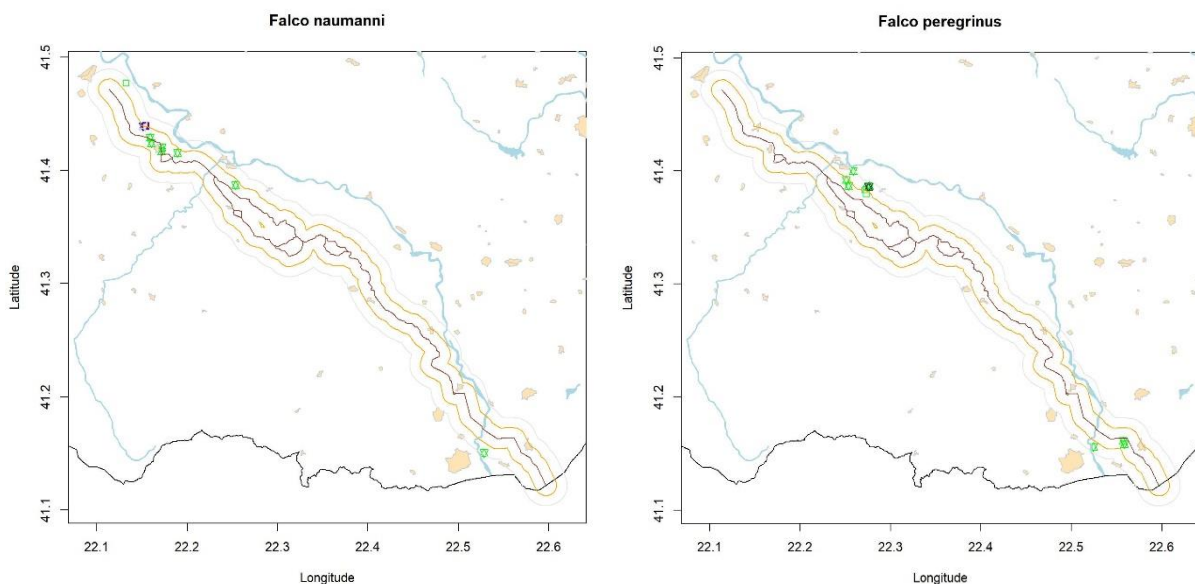
A few pairs possibly breed along the Vardar river in Gevgelija region, and they might be affected locally via disturbance. **Destruction of steep banks along the river**, where this species breeds (and where the sand Martin Riparia riparia have colonies) should not be allowed during project implementation.

### **Falco naumanni**

The lesser kestrel is one of the trigger species for the IBA Tikves Region. Its population in the pipeline corridor still seems to be strong (estimated at about 40 pairs), it and will be affected negatively by habitat destruction (loss of foraging areas). This will lead to a decline in the breeding success. Mitigation measures should include **avoidance of construction works in the pastures between April 1st and July 15th**, and also reduction of other threats, such as the likely electrocution on dangerous electricity poles in the region, which might be insulated as a compensatory measure.

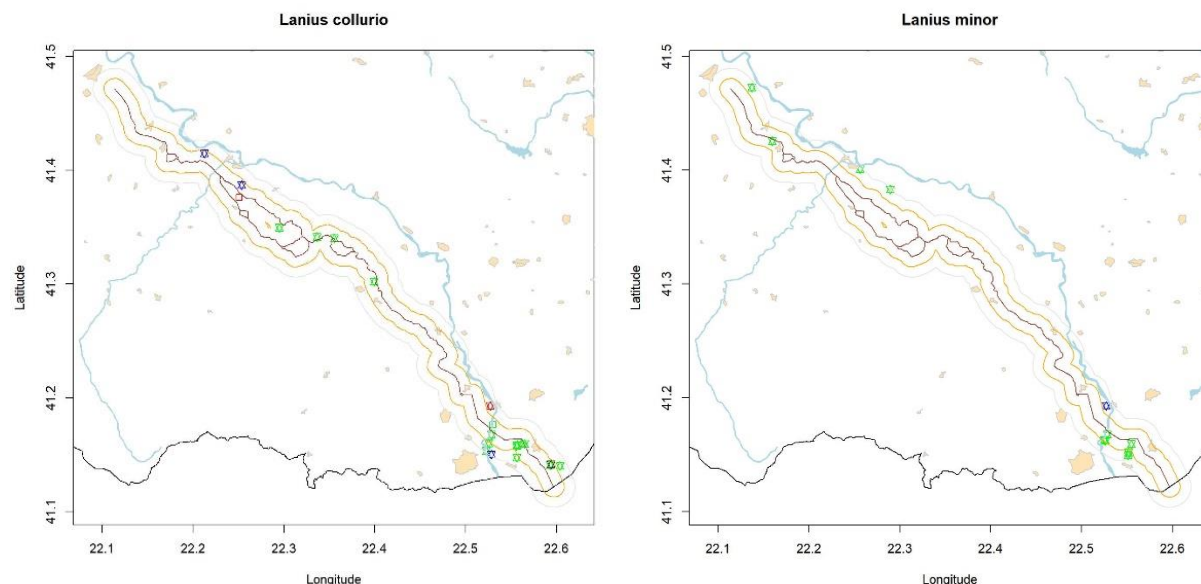
### **Falco peregrinus**

One pair of peregrines breed in the wider area of the pipeline, in Demir Kapija Gorge, and individual birds are observed in the fields of Gevgelija in the breeding season. It will not be significantly impacted by the project implementation.



### **Lanius collurio**

The red-backed shrike is a common species in the habitats with bushes in North Macedonia and along the project corridor. Its population will be directly affected by habitat loss, but no substantial mitigation measures can be proposed.



### **Lanius minor**

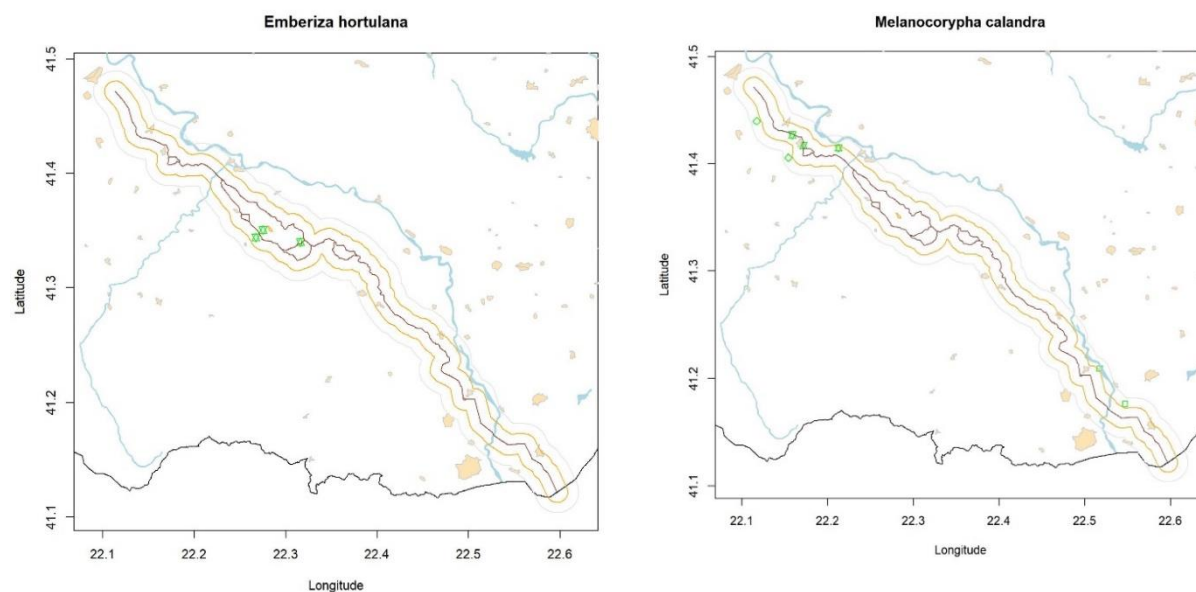
The lesser grey shrike is locally present along the pipeline corridor. Effects on its population are going to be temporary only. The national population is quite strong.

### **Emberiza hortulana**

The ortolan bunting is a locally common species in Macedonia, and also along the project corridor. It is not anticipated to be significantly impacted by the project implementation, and the effects will be only temporary.

### **Melanocorypha calandra**

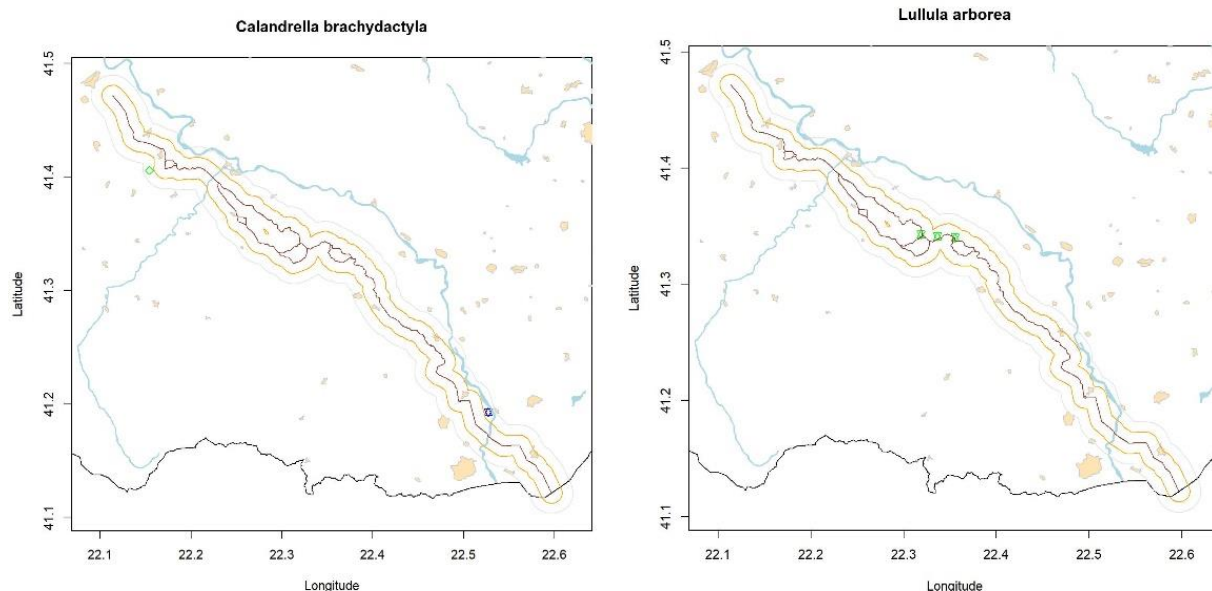
The calandra lark is locally abundant in the fields near Negorino and Gevgelija, and it will be affected by habitat loss. Effects will be temporary, and the population will recover within two years.





### **Calandrella brachydactyla**

The short-toed larks locally breed in the regions of Negotino and Gevgelija, but its main national strongholds are in the central and dry parts of North Macedonia. Thus, the project will have insignificant negative effect on the national population, which will also be temporary.

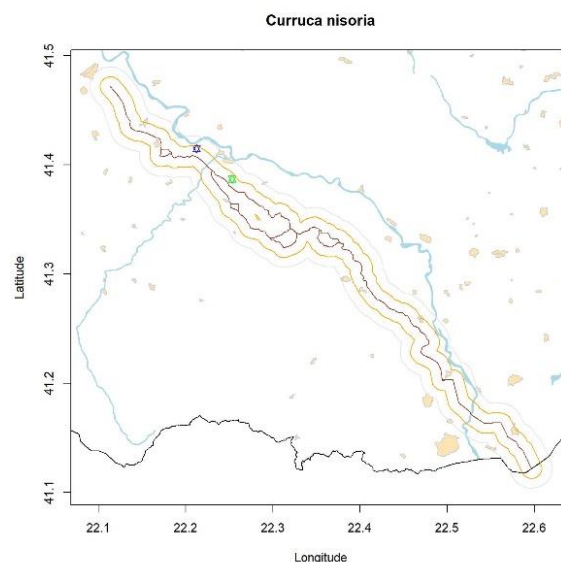


### **Lullula arborea**

Some habitat loss is envisaged to affect the local population of the woodlark, but the species is common and abundant in its favourable habitats elsewhere in North Macedonia.

### **Curruca nisoria**

The barred warbler is locally found in the project corridor, and its national population will be insignificantly affected by the project implementation.



### **Valorisation**

Here, the importance of bird fauna is briefly analysed with regard to the Global IUCN Red List (IUCN 2021), the European Red List of Birds (BirdLife International 2015), and the EU Directive on Protection of

Wild Birds (The European Parliament & The Council of the European Union 2009). Table 16 provides a short summary of the valorisation.

Table 16: Valorisation of birds against selected international criteria. Abbreviations: VU – vulnerable; NT – near-threatened; LC – least concern.

Criteria and category of Valorisation		Non-Breeding	Possible Breeding	Probable Breeding	Confirmed Breeding	Total
IUCN GRL	EN				1	1
	VU				2	2
	NT	5		2		7
	LC	46	60	34	36	176
IUCN ERL	VU	5			2	7
	NT	1	2	1	1	5
	LC	45	58	35	36	174
Bird Directive	Annex I	15	15	11	11	52
	Annexes I & II/A			1		1
	Annexes I & II/B	1				1
	Annex II/A	2			1	3
	Annex II/B	5	7	5	4	21
	Annexes II/A & III/A			2	1	3
	Annexes II/A & III/B	7				7
	Annexes II/B & III/B	1				1
	Not included	20	38	17	22	97

## Mammals

### Introduction

This report presents the findings from the study on mammals in the area of the proposed pipeline construction Stojakovo – Negotino, conducted during the period April – May 2022. Through literature review and field surveys, the aim of the study was to assess the diversity of mammalian fauna in the area planned for construction of the pipeline, conduct valorisation, and identify the species of special conservation interest or priority biodiversity features.

The assessment of the mammalian fauna along the broader area of the planned pipeline was done through literature review and field visits, by applying appropriate methodology for data collection. In view of the data from the available scientific literature (Kaczenskyet al. 2013; Kryštufek & Petkovski 1989, 1990, 2003; Kryštufek et al. 1992; Kryštufek et al. 1998; Micevskiet al. 2014; Mitchell-Jones et al 1999; Petrov 1992; Polednik et al. 2008; Петковски 1998) as well as the data from unpublished project reports, the number of recorded mammal species in the project area is 30. Most of the species are common and widespread in the Republic of N. Macedonia, and they are found in all types of habitats, with different species composition.

## Methodology

Depending on the group, field surveys on mammals were done by employing several widely used techniques and methods:

- Sign surveys - one of the most used methods for determination of the presence of large and medium-sized mammal species. Transects were searched for footprints, scats, hairs and other signs of passing mammal species. Transects are usually set in specific habitats where the possibility of encountering certain species is higher. When found, all signs were photographed, and data on identified species, date, location, habitat and type of data were recorded.
- Ultrasound audio-detection – a commonly used non-invasive method for studying bat distribution and ecology. This method requires use of a special device – an ultrasound bat detector, which detects and records ultrasounds emitted by bats. The recorded sounds were afterwards analyzed using specialized software. The calls were recorded along the walked transects in the area by means of a Pettersson D240X ultrasound detector. The analysis of the calls was done by the BatSound v.4.01 software.

## Field Study Sites

Field research was conducted at 12 selected locations along the pipeline corridor aimed at surveying diverse habitats and ascertaining the occurrence of important species (Fig. 63).

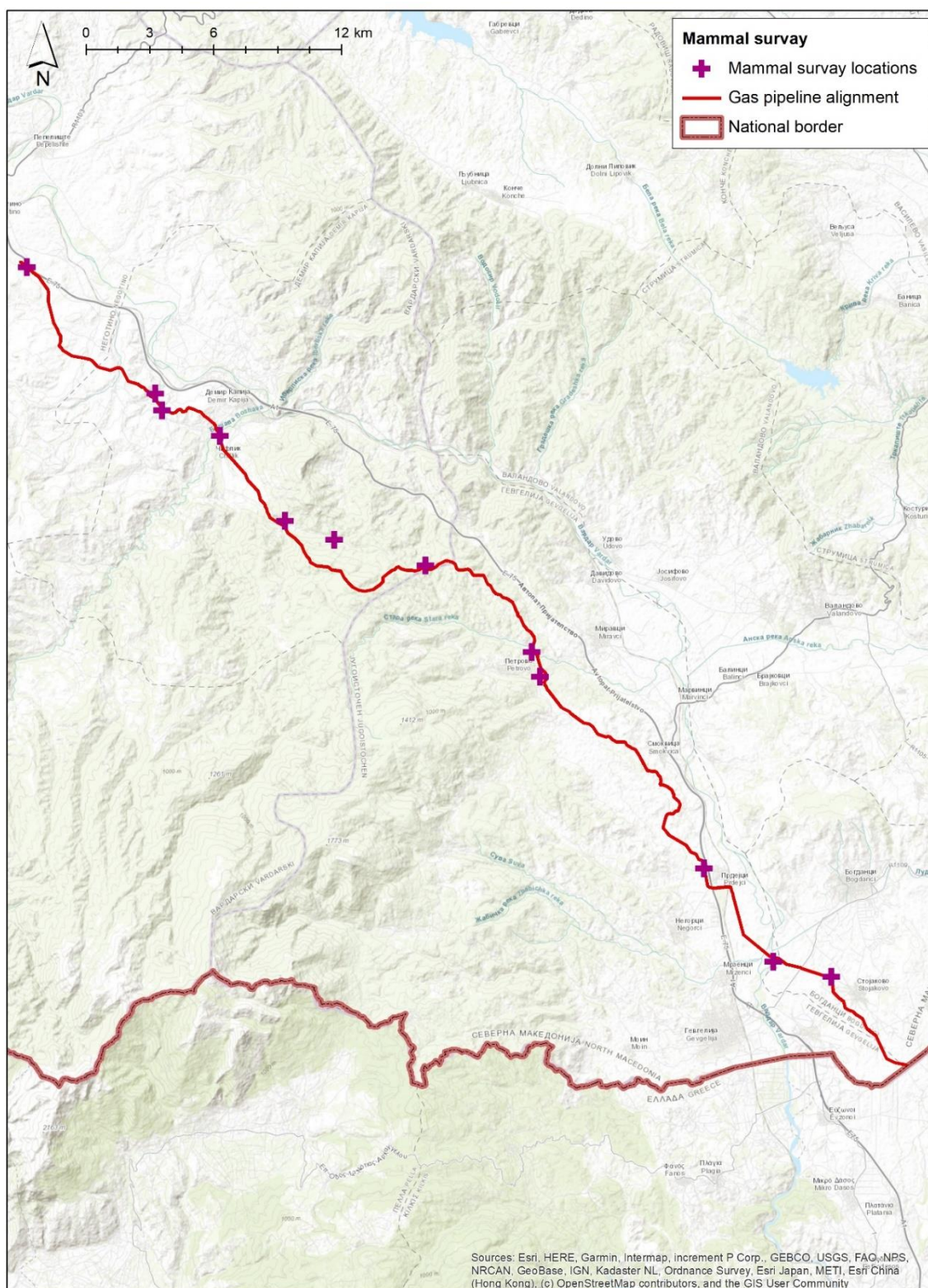


Figure 63: Locations visited during the field surveys.

## Results of the Study

Field research was done at 12 selected locations along the pipeline corridor intended for surveying different habitats and ascertaining the occurrence of important species. The studied locations and the lists of species are provided below.

Table 17. Study location of birds

Species	Eastern white oak woods HD *91AA	Pseudomaquis	Riparian woodlands HD *91EO, 92AO	Dry grasslands HD 6210	Sub-Mediterranean meadows HD 6540	Rivers and streams HD 3260, 3290	Agricultural area (fields, acres, orchards)	Deciduous tree plantations (black locust, poplar...)	Pine plantations	Urban and urbanised areas
	Natural Habitats					Modified Habitats				
<i>Erinaceus roumanicus</i>		+			+		+	+		+
<i>Neomys anomalus</i>			+							
<i>Crocidura suaveolens</i>					+		+			
<i>Crocidura leucodon</i>					+		+			+
<i>Talpa europaea</i>					+		+			
<i>Ondatra zibethicus</i>			+			+				
<i>Microtus levis</i>			+		+		+			
<i>Apodemus flavicollis</i>	+	+	+		+			+		
<i>Aodemus sylvaticus</i>	+	+		+	+		+	+		
<i>Mus musculus</i>										+
<i>Mus macedonicus</i>		+	+		+		+			
<i>Glis glis</i>	+	+								
<i>Dryomys nitedula</i>	+	+								
<i>Myotis mystacinus</i>	+	+		+						+
<i>Pipistrellus pygmaeus</i>	+		+					+		
<i>Pipistrellus kuhlii</i>		+					+			+
<i>Pipistrellus nathusii</i>			+							+
<i>Pipistrellus pipistrellus</i>			+			+		+		+
<i>Hypsugo savii</i>					+	+				+
<i>Miniopterus schreibersii</i>	+	+								
<i>Tadarida teniotis</i>		+								+
<i>Lepus europaeus</i>		+		+	+		+			



<i>Canis lupus</i>	+	+		+				+	+	
<i>Vulpes Vulpes</i>	+	+	+	+	+		+	+	+	
<i>Felis silvestris</i>	+	+							+	
<i>Mustela nivalis</i>			+		+		+			
<i>Martes foina</i>	+	+	+	+	+		+	+		+
<i>Meles meles</i>	+	+	+				+			
<i>Lutra lutra</i>			+			+				
<i>Sus scrofa</i>	+	+							+	
<i>Capreolus capreolus</i>	+	+								

### Valorisation

In consideration of the data from the available scientific literature and the field research, the number of recorded mammal species in the broader area of the pipeline corridor Stojakovo - Negotino is 31. The complete list of all recorded mammal species is provided in Table 18.

Table 18: A list of mammal species occurring in the broader area of the pipeline corridor Stojakovo – Negotino, and their valorisation. List of mammal species in the wider area of the pipeline corridor and their valorisation.

	Species	IUCN Global Red List	European Red List	National Red List of Mammals	Habitats Directive	Bern Convention	Bonn Convention	Law on Hunting	Law on Nature
1	<i>Erinaceus roumanicus</i>	LC	LC						
2	<i>Neomys anomalus</i>	LC	LC			App. III			
3	<i>Crocidura suaveolens</i>	LC	LC			App. III			
4	<i>Crocidura leucodon</i>	LC	LC			App. III			
5	<i>Talpa europaea</i>	LC	LC						
6	<i>Ondatra zibethicus</i>	LC	LC						
7	<i>Microtus levis</i>	LC	LC						
8	<i>Apodemus flavicollis</i>	LC	LC						
9	<i>Aodemus sylvaticus</i>	LC	LC						
10	<i>Mus musculus</i>	LC	LC						
11	<i>Mus macedonicus</i>								
12	<i>Glis glis</i>					App. III		PP	
13	<i>Dryomys nitedula</i>	LC	LC		A. IV	App. III			

	Species	IUCN Global Red List	European Red List	National Red List of Mammals	Habitats Directive	Bern Convention	Bonn Convention	Law on Hunting	Law on Nature
14	<i>Myotis mystacinus</i>	LC	LC		A. IV	App. II	App. II		
15	<i>Pipistrellus pygmaeus</i>	LC	LC		A. IV	App. II	App. II		
16	<i>Pipistrellus kuhlii</i>	LC	LC		A. IV	App. II	App. II		
17	<i>Pipistrellus nathusii</i>	LC	LC		A. IV	App. II	App. II		
18	<i>Pipistrellus pipistrellus</i>	LC	LC		A. IV	App. III	App. II		
19	<i>Hypsugo savii</i>	LC	LC		A. IV	App. II	App. II		
20	<i>Miniopterus schreibersii</i>	VU	LC		A. II & IV	App. II	App. II		PS
21	<i>Tadarida teniotis</i>	LC	LC		A. IV	App. II	App. II		
22	<i>Lepus europaeus</i>	LC	LC			App. III		TP	
23	<i>Canis lupus</i>	LC	LC	NT	A. II, IV & V	App. II		WP	
24	<i>Vulpes Vulpes</i>	LC	LC					WP	
25	<i>Felis silvestris</i>	LC	LC		A. IV	App. II		PP	SP
26	<i>Mustela nivalis</i>	LC	LC			App. III		WP	
27	<i>Martes foina</i>	LC	LC			App. III		WP	
28	<i>Meles meles</i>	LC	LC			App. III		PP	PS
29	<i>Lutra lutra</i>	NT	NT	VU	A. II & IV	App. II		PP	SP
30	<i>Sus scrofa</i>	LC	LC					TP	
31	<i>Capreolus capreolus</i>	LC	LC			App. III		TP	

\*PP = a permanently protected game species; TP = a temporarily protected game species (closed and open hunting season); WP = a game species without protection; SP = a strictly protected species; PS = a protected species.

Species valorisation was accomplished by employing the following criteria: the IUCN Global and European Red List, the National Red List of Mammals, the EU Habitats Directive, the Bern Convention, the Bonn Convention, and the applicable national legislation (Table 18).

Of the 31 species recorded, one species (*Miniopterus schreibersii*) is categorized as vulnerable (VU) according to the IUCN Global Red List. One species (*Lutra lutra*) is listed as vulnerable (VU), and one species (*Canis lupus*) as near threatened (NT) according to the National Red List of Mammals. Two species are included in Annex II & IV, ten species in Annex IV, and one in Annex II, IV and V of the EU Habitats Directive. Ten species are listed as strictly protected fauna species in Appendix II, and other 10 are listed as protected fauna species in Appendix III of the Bern Convention. All 8 species of bats are listed in Appendix II of the Bonn Convention. In keeping with the provisions of the Law on Hunting, 4 species are categorized as permanently protected game species whereas 3 species have temporary

(seasonal) protection (open and closed hunting season). Two species are listed as strictly protected, and other two as protected species according to the List of Strictly Protected and Protected Species of the Law on Nature Protection of the RM.

In compliance with the criteria, the Eurasian otter (*Lutra lutra*), the wolf (*Canis lupus*), and Schreiber's bent-winged bat (*Miniopterus schreibersii*) are considered as species of particular conservation concern (priority biodiversity features) in the broader area of the pipeline corridor.

The Eurasian otter (*Lutra lutra*) inhabits most of the existing major water bodies in N. Macedonia. The population size is estimated to be 350-400 individuals. Otters are strongly dependent on riparian vegetation and availability of denning sites (holts). Most otter activity occurs in a narrow strip along the water's edge but they may be found up to 1 km away from water. In the broader area of the pipeline corridor, presence of Eurasian otter was recorded at a number of locations along the rivers Vardar, Boshava, Dosnnica and Stara Reka.

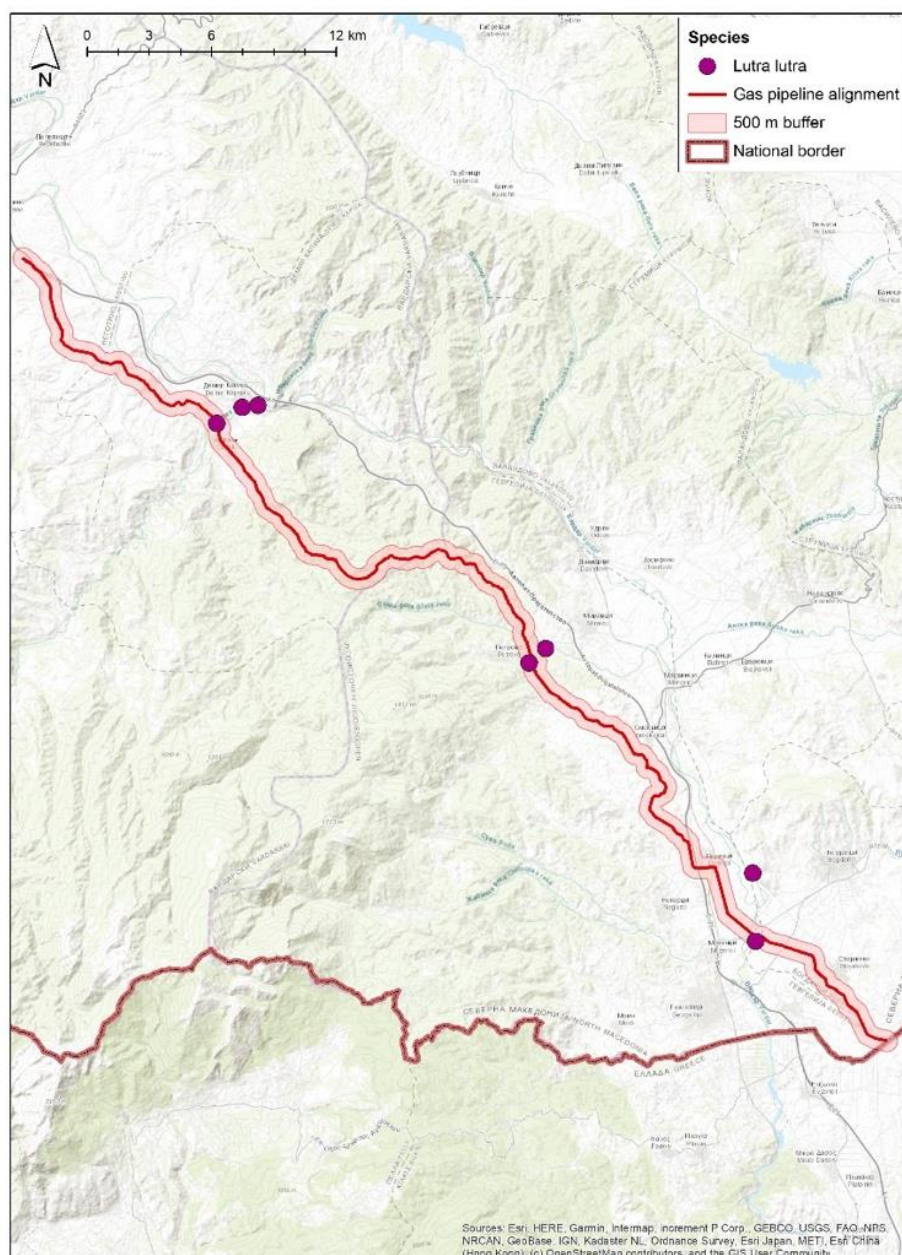


Figure 64: The Eurasian otter distribution in the broader area of the pipeline corridor.

The wolf (*Canis lupus*) is a common and widely distributed species in N. Macedonia, with a population consisting of more than 400 individuals. It is a highly adaptable species that inhabits variety large array of

habitats (forests, scrublands, grasslands, pastures etc.). Although its occurrence was confirmed only at two sites, the wolf is a common species in the area of interest.

There are no data about the precise distribution and population size of the Schreiber's bent-winged bat (*Miniopterus schreibersii*) in N. Macedonia, but it is deemed widespread. This species favors hardwood forest-rich habitats, and it mainly roosts in colonies in karst caves, mines and cellars with other cave-dwelling species. Along the pipeline corridor, the species was recorded at one location in Demir Kapija.

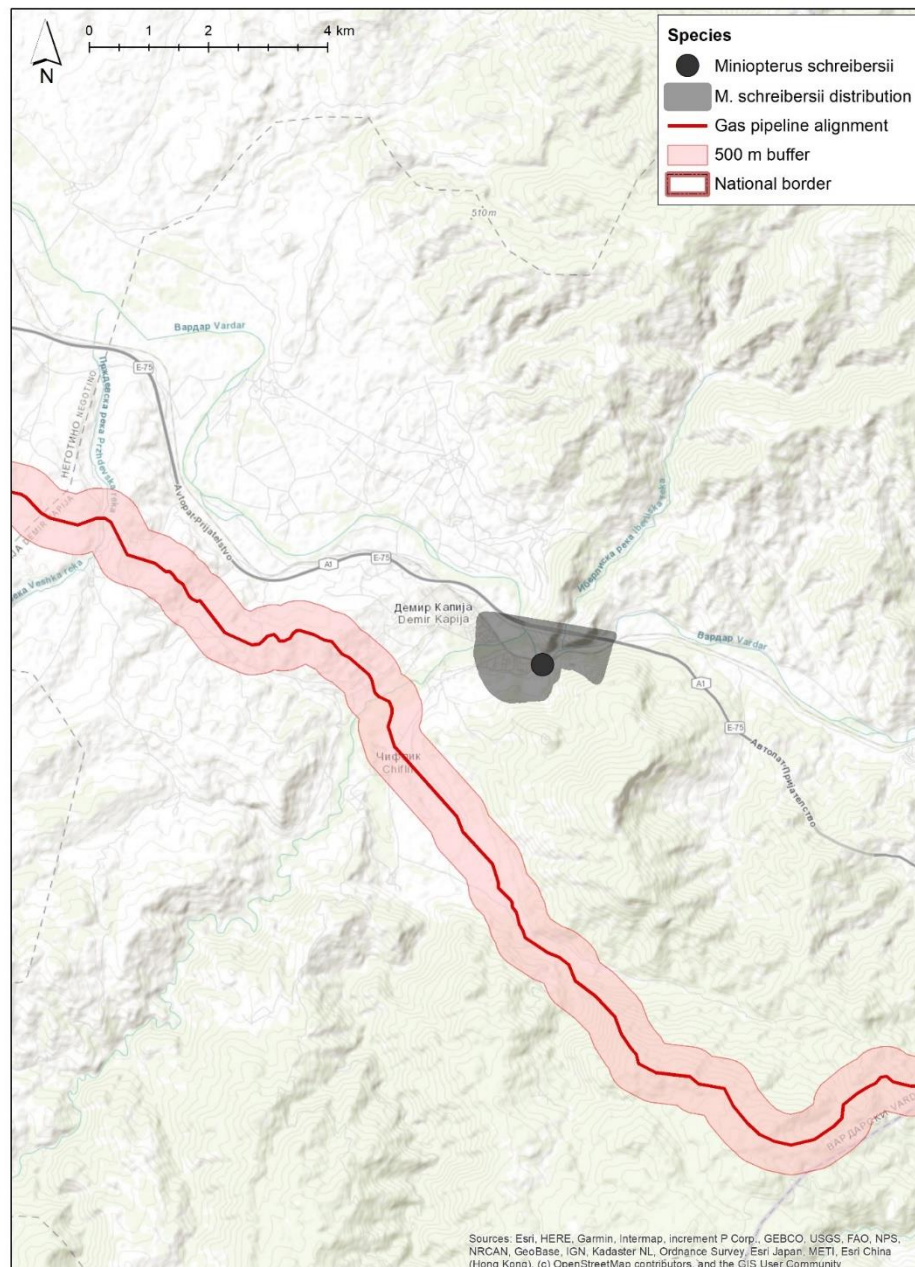


Figure 65: The Schreiber's Bent-winged bat distribution in the broader area of the pipeline corridor.



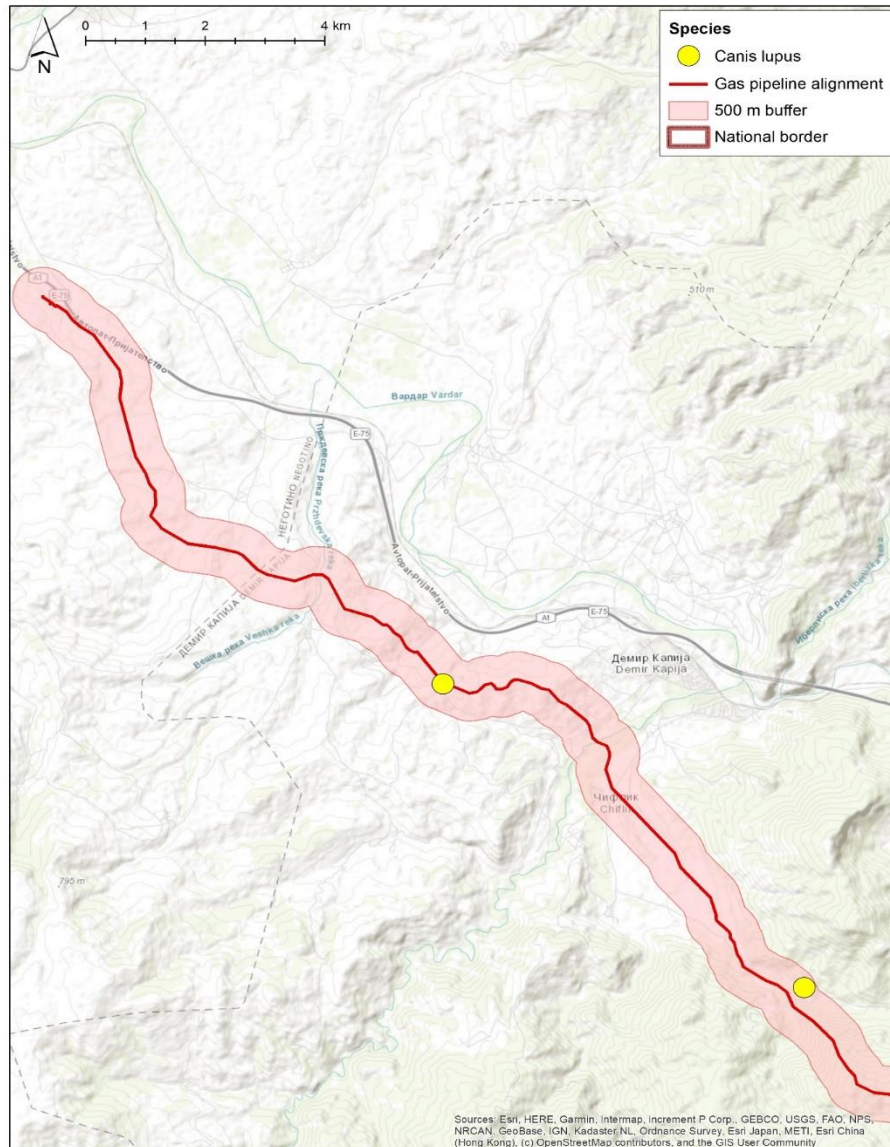


Figure 66: The wolf distribution in the broader area of the pipeline corridor.



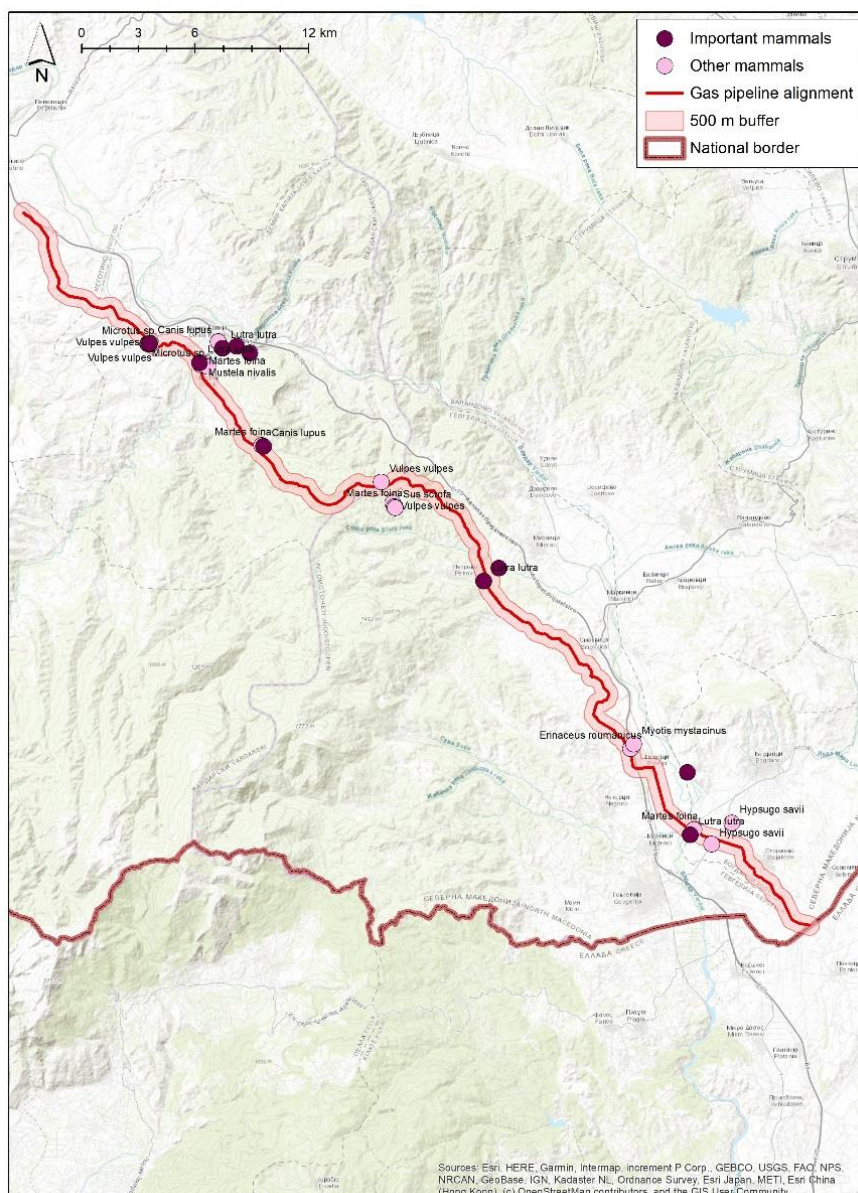


Figure 67: Locations of all mammal species observed during the field visits.

### 3.4.3 Protected and Designated Areas

The Interconnector gas pipeline Project overlaps with a number of nationally protected and internationally recognised areas, as set out below:

- **Demir Kapija** -Nature Monument (protected area) under the Spatial Plan of MK ( IUCN II category)
- **Studena Glava** -Nature Park (*proposed* for protection under the Spatial Plan of NM)<sup>13</sup>
- **Negorski Banji** Nature Monument (*proposed* for protection under the Spatial Plan of MK)
- **Aeolian sands - Vardar** Nature Park (*proposed* for protection under the UNDP/GEF project dated 2010)
- The project area isn't situated within potential Natura 2000 site

<sup>13</sup> The field surveys showed that this area is degraded due to logging

- No UNESCO Natural World Heritage Sites, Alliance for Zero Extinction (AZE) sites, ecosystems evaluated using the International Union for the Conservation of Nature (IUCN) Red List of Threatened Ecosystems or ecosystems recognized by the scientific community as being associated with key evolutionary processes, was identified
- The project area is located within Key Biodiversity Area, according to IBAT data base
- The project area is located within proposed IBA, IPA and Emerald site (Annex 2,3)
- The project area is crossing steppe ecological corridor
- Some of the species and habitats are a priority for conservation (listed by the EU Habitats Directive and Birds Directive, Bern Convention, IUCN Red List of Threatened Species)

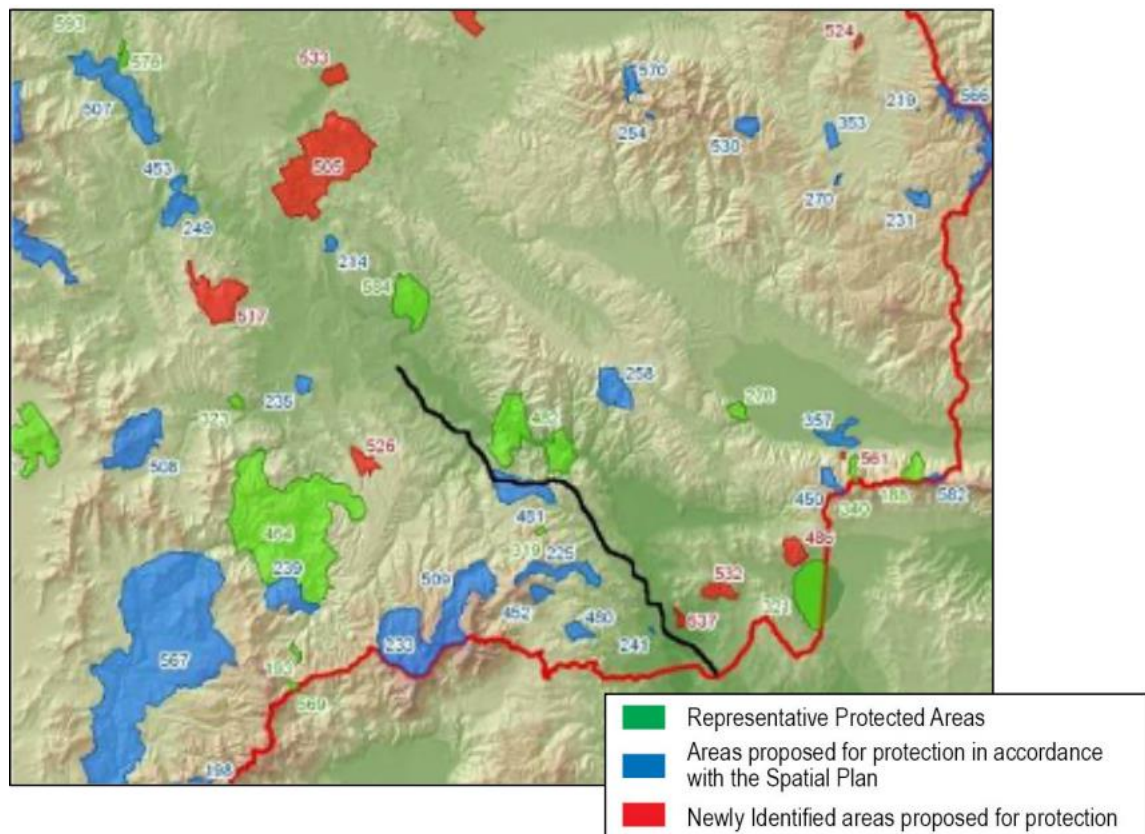


Figure 68. Map of protected and proposed areas for protection

Table 19 give a list all identified designated sites in the Aol.

Table 19. Sites with the potential to be impacted by the Project

Site CODE	Site Name	Site Description / Habitats	Impact from The Project	Distance from PZI (m)	Direction from The Project
<b>INTERNATIONALLY DESIGNATED AREAS</b>					
/	<b>IPA Negorski Banji</b>	The location of the area fully overlaps with the namesake area proposed for protection in the category of Nature Monument. It is located approximately 2 KM from the nearest point of the gas pipeline route	Not crossed by the gas pipeline	2 km	App. 2 KM from the nearest point of the gas pipeline route
/	<b>IPA Demir Kapija Canyon</b>	The area is located in the south-central part of North Macedonia on 100 to 900 metres altitude. It mainly covers areas with xero-thermophilic kermes oak shrublands, thermophilic oak forests and thermophilic Greek juniper forests on the rocky biotopes. It includes important habitats on European level in relation of the EUNIS classification E1, F3, F9, G1, G3 and H3. Also, three important plant species are present of which the species <i>Anthemis meteorica</i> meets the criterion A(iv), whereas the species <i>Heptaptera macedonica</i> and <i>Verbascum macedonicum</i> meet the criteria A(iii).	Not crossed by the gas pipeline	/	/
MK029	<b>IBA Lower course of the river Vardar (Lower Vardar)</b>	The area has been identified as an important area for nesting of two species of terns ( <i>Sterna hirundo</i> and <i>Sternula albifrons</i> ), as a nesting area of almost 10% of the national white stork population ( <i>Ciconia ciconia</i> ) and as a potential bottleneck for migration of large floating species of birds (birds of prey, storks, etc.) In addition, the flood meadow of the Gjol area (in the vicinity of the village of Bogorodica) is an important stop-over site for many wintering species in this part of North Macedonia. This includes several species of duck and egret family, and the greater flamingo ( <i>Phoenicopterus roseus</i> ) has been spotted on several occasions. Also, this locality is crucial in the feeding of the breeding non-resident species such as the large nesting populations of white storks in the villages of Stojakovo and Bogorodica.	Crossed by the gas pipeline	12 km of the PZI is in this IBA	The gas pipeline corridor intersects the area between KM 0+000 and KM 9+500 and KM 10+500 and KM 13+000
MK 008	<b>IBA Demir Kapija George</b>	The canyon covers a surface area of 9.665 ha and it is the longest canyon of the river Vardar (19 KM). It runs through the zone of limestone and eruptive rocks which separates the Tikves Valley in the northwest from the Gevgelija-Valandovo Valley in the southeast. The Demir Kapija Canyon is one of the richest ornithological reserves in Europe by the presence of rare birds of prey: the griffon vulture ( <i>Gyps fulvus</i> ), the Egyptian vulture ( <i>Neophron percnopterus</i> ), the golden eagle ( <i>Aquila chrysaetos</i> ), the short-toed snake eagle ( <i>Circaetus gallicus</i> ), the long-legged buzzard ( <i>Buteo rufinus</i> ), various falcons ( <i>Falco peregrinus</i> , <i>Falco naumanni</i> ), as well as some less common species of birds such as <i>Hieraaetus pennatus</i> , <i>Milvus migrans</i> , <i>Falco biarmicus</i> , <i>Cerchotrichas galactotes</i> etc.	Crossed by the gas pipeline	3 km of the PZI is in this IBA	The line gas pipeline corridor intersects the area between KM 47+250 to KM 48+800 and from KM 50+800 to KM 52+250

Site CODE	Site Name	Site Description / Habitats	Impact from The Project	Distance from PZI (m)	Direction from The Project
MK013	<b>IBA Tikvesh region</b>	IBA Tikves region is located in the south-central part of North Macedonia, south of the city of Negotino, on a surface area of 18.696 ha. The area is important because of the presence of two Egyptian vultures ( <i>Neophron percnopterus</i> ) in its southern part, and also because of the presence of 230 to 250 nesting pairs of the lesser kestrel ( <i>Falco naumanni</i> ), which is nesting only in the villages and it is present in the northern part of the area. In the northern part of the area, 1-2 pairs of eastern imperial eagle ( <i>Aquila heliaca</i> ) are nesting, as well as at least one pair of lanner falcon ( <i>Falco biarmicus</i> ). Also, the largest colony (60 to 90 pairs) of grey heron ( <i>Ardea cinerea</i> ) exists in this region.	Crossed by gas pipeline	The line gas pipeline corridor penetrates more than 10 KM	The line gas pipeline corridor penetrates more than 10 KM in the area (point KM 57+000).
MK0000005	<b>Emerald area Demir Kapija Canyon</b>	The Emerald area Demir Kapija Canyon covers a surface area of 30.08 hectares and it is located more than 5 KM away from the gas pipeline route. very small part of it overlaps with the Nature Monument Demir Kapija (0.6%) in its easternmost borders	/	/	/
MK0000022	<b>Emerald area blato Negorski Banji</b>	Fully overlaps with the IPA Negorski Banji, as well as with the namesake area proposed for protection in the category of Nature Monument.	Not crossed by the pipeline	approximately 2 KM from the nearest point of the gas pipeline route.	/
Not official nomination	KBA Demir Kapija* (11992 ha)	= IPA Demir Kapija which overlaps with the same IBA Demir Kapija	Crossed by the pipeline		
<b>NATIONALLY DESIGNATED AREAS</b>					
482	Natural Monument Demir Kapija	Protected area covers the Demir Kapija Canyon and extends from the populated area Demir Kapija to the village of Udovo in the south (Figure no. 5-79). This area includes several existing protected and proposed areas for protection: Demir Kapija, Iberliska Reka, Klisurska Reka, the caves Bela Voda and Goren Zmejovec, Krastovec, Shtuder, Mala Javorica. It is the farthest northern part of the modified Mediterranean area along the river Vardar. It is characterized by the presence of significant thermophilic communities and hazmophytic vegetation. Interesting riparian vegetation develops in the canyons on the plane-tree communities. Very rare species of plants can be found on the calcareous rocks and stony fields. The area is widely known for its importance for the birds of pray and many Mediterranean species can be found as well. One of the three North Macedonian colonies of griffon vulture, booted eagle, golden eagle, Egyptian vulture, black stork can be found here. Especially noteworthy is the cave fauna of	Not crossed by the pipeline	~0,45 away from PZI	



Site CODE	Site Name	Site Description / Habitats	Impact from The Project	Distance from PZI (m)	Direction from The Project
		Bela Voda represented by several troglobiont and troglophilic species. Endogean habitats are also known to have several endemic species. The caves are also important because of the bat colonies that can be found in there. Interesting species of invertebrates live in the small tributaries of the river Vardar (Iberian crab, caddisflies, Epallage fatime), and also several species of fish spawn			
481	Natural Park Studen Glava Proposed for protection – Spatial plan of MK	<p>It covers parts of the Marjanska Planina (Kozuf), between the villages of Koprishnica and Dren (Demir Kapija) and Projkov Rid. The locality is characterised by beech forests, few rare species of plants and insects. It is characterized by the presence of beech stands at low altitudes, in places even lower than the Platanus communities. The area is proposed for protection under the Spatial Plan of the Republic of North Macedonia dated 1999.</p> <p>The area is proposed for the Park of nature according to the Spatial Plan of MK since 1999 due to due to occurrence on beech stands (about 20 ha) at low altitude. In the scope the route is dominated by flat forest which is in some parts strong degraded due to intensive logging. Hence the impact on the stage the construction is small and refers to fragmentation of to a large extent of the tiled forest that is moderately sensitive. It is needed revision of boundaries and natural values of PP "Studena Glava" due to data obsolescence (expert opinion).</p>	Crossed	Gas pipeline route penetrated 7,1 km	The gas pipeline route fully penetrates the area of Studena Glava from KM 38+700 to KM 47+200
537	Aeolian sands - Vardar NP, Proposed for protection – MES (UNDP/GEF	The area is located along the river Vardar, west and southwest from the village of Gjavoto (Gevgelija). It is proposed in the category of Nature Park in 2011 by NGO. The sandy habitats around the river Vardar and the riparian habitats with tamarix are important for the area. The largest colony of sand martin (Riparia riparia) in the country can be found along the riverbed, and the only nesting site of the little tern <i>Sterna albifrons</i> is located on the river island, which is nesting in a mixed colony with the common tern, <i>Sterna hirundo</i> .	Not crossed		0.7 away from the PZI
241	Negorski Banji NM, Proposed for protection – Spatial plan of MK	The area is proposed for protection under the Spatial Plan of the Republic of North Macedonia dated 1999. The locality is situated south of the populated area Negorci in the circle of the thermal spa. The area belongs to the Mediterranean biogeographical region and covers surface areas with relict swamp habitats with <i>Cladium mariscus</i> . The presence of the riparian plant community of narrow-leafed ash is noteworthy ( <i>Fraxinus angustifolia</i> ssp. <i>macrocarpa</i> ). The location of the area fully overlaps with the namesake Important Plant Area (IPA Negorski Banji) and the Emerald Area Negorski Banji.	Not crossed	App 2. Km away from the PZI	/

### 3.4.4 Biocorridors

Ecological (bio) corridors connect different parts of a habitat, allowing movement of animals and/or plants between them. This movement can be a significant survival factor for many species in relation to the changes brought about by changes in land use, development and climate change. One function of bio-corridors is to preserve vital ecological processes and relations by sustaining the connection between habitats and the species populations. Bio-corridors provide daily, periodical and/or seasonal movements and migrations of different animal species, as well as facilitating the propagation of plants. The most important part through which the gas pipeline route passes is the protection zone that refers to the bottleneck Demir Kapija (fig.69 The gas pipeline is shown in black).

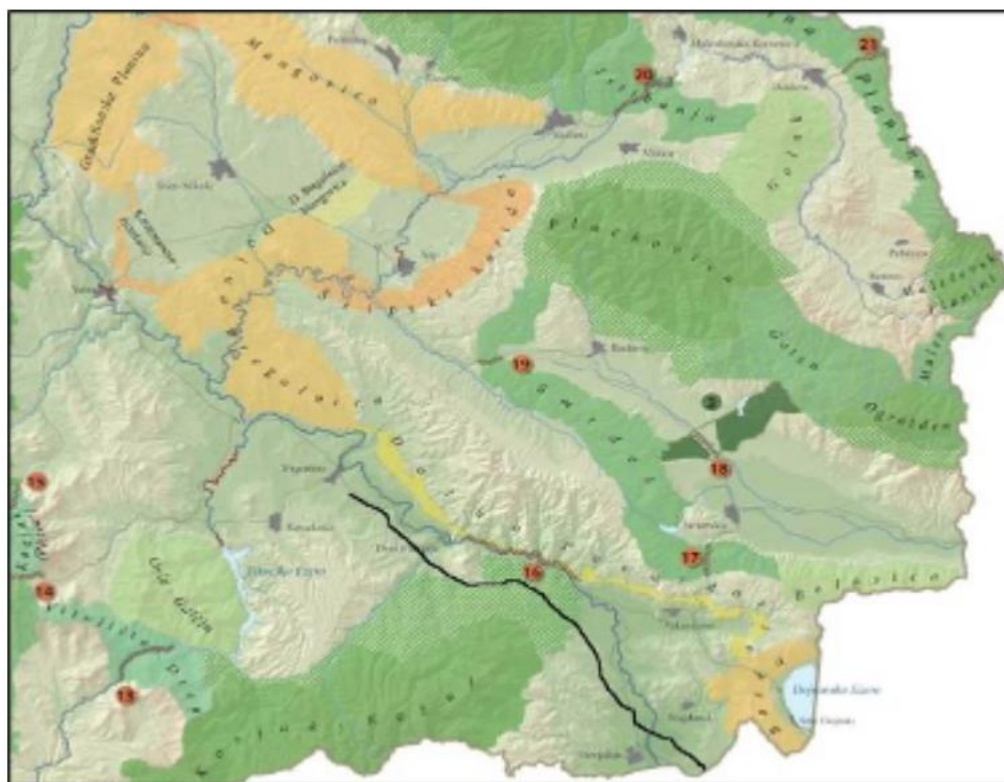


Figure 69. Location of Bio-Corridor along route of the proposed pipeline (Sources: Project: Development of the National Ecological Network in the Republic of Macedonia (MAK-NEN))

Protection zones are very important because they separate areas where the primary purpose is to mitigate the harmful external influences, caused by inappropriate forms of land use. The protection zones allow sustainable use of the nature. This protection zone is important because it connects the Kozuf Mountain and the higher parts of the Vardar Valley with the river Vardar and other rivers and streams in the area, providing access to drinking water. This is especially important for the normal life cycle of many animals, such as:

- amphibians – migrations during breeding to the nesting areas (common toad, European green toad);
- Brown bear – movements in search for food from Kozuf mountain to the Vardar Valley; the brown bear is especially rare in this area and these corridors are very important for maintaining their small number, the bear cannot be found on the left side of the river Vardar
- grey wolf – movements in search for prey;
- ungulates, especially deer – movements and seasonal migrations for grazing;
- small mammals – periodical and seasonal movements.

## 3.5 Ecosystem Services

Ecosystem Services are organized into four types:

- i. provisioning services, which are the products people obtain from ecosystems (e.g. agricultural products, water for drinking, construction materials, etc.);
- ii. regulating services, which are the benefits people obtain from the regulation of ecosystem processes (e.g. purification of water and air, natural hazard mitigation, etc.);
- iii. cultural services, which are the nonmaterial benefits people obtain from ecosystems (e.g. spiritual and sacred sites, recreational purposes, aesthetic enjoyment, etc.); and
- iv. supporting services, which are the natural processes that maintain the other services (e.g. nutrient capture and recycling, primary production, pathways for genetic exchange, etc.).

Where potentially significant project-related risks to Ecosystem Services are identified, "Priority Ecosystem Services" are identified. Priority Ecosystems Services are defined as (i) those services on which project operations are most likely to have an impact and, therefore, which result in consequent adverse impacts to Affected Communities and/or (ii) those services on which the Project is directly dependent for its operations (e.g., water).

For the purpose of this analysis, Ecosystem Services are categorized as two types as follows:

Type I: Provisioning, regulating, cultural and supporting ecosystem services, over which the client has direct management control or significant influence, and where *impacts on such services may adversely affect communities*.

Type II: Provisioning, regulating, cultural and supporting ecosystem services, over which the client has direct management control or significant influence, and *on which the Project directly depends* for its operations.

### Baseline development process

Information gathered from April- June 2022 for the benefit of the supp.ESIA was also incorporated into the Ecosystem Services baseline assessment. In most cases, the ecosystem services covered in this analysis and analysed in the Biodiversity Assessment-BA (i.e. Critical Habitat Assessment CHA) are the same set of services. Occasionally, the organisational structure of the ecosystem services covered in this document departs from that employed in the BA /CHA and in those cases the differences are noted.

#### 3.5.1 Provisioning Services

Among the provisioning services provided by the ecosystem within the Project area, many have the potential to be negatively impacted. This does not necessarily imply an impact, but suggests that the Project could either directly or indirectly influence services within the affected communities.

**Livestock.** Small and large cattle are raised in the municipality. There are mostly agricultural holdings where poultry is raised, followed by pigs, as well as cattle and goats. Individual livestock is developed on a small scale, thus mainly concerned by the local population. The grasslands in the area of the gas pipeline corridor are not a common type of vegetation. They can be covered with kermes oak or sessile oak and by cutting the shrubs they have been turned into arable land. Therefore, the grasslands are present only in a small portion of the researched area and very few are of natural origin. Most of them occur as secondary formations surrounded by dispersed vegetation with different level of degradation. These ecosystems are generally spread in the hilly areas along the village of Stojakovo and along the stretch between Demir Kapija and the village of Przdevo. The Project could affect this service both directly and indirectly. Due to the great length of the linear structure, it is impossible to fence the entire construction site and, therefore, there is a likelihood of incidents at the construction sites related to unlawful presence of persons or accidental intrusion of livestock. In order to prevent any such situations, it is necessary for the Operator, and especially the Contractor, to inform the local public. The magnitude of impacts can be controlled through proper management actions. These services are not priority Ecosystem Services.

**Local food provision. Wild fruits:** With regard to the Project area, collection of wild fruits by the local population is typically practiced. Dog rose, raspberries, blackberries, Cornelian cherry and plums, are collected by the local population and used for making juice and jam. **Medicinal and aromatic plants:** the most common medicinal and aromatic plants and berries in the area of interest are: *Achillea millefolium*, *Althaea officinalis*, *Chamomilla recutita*, *Crataegus monogyna*, *Cornus mas*, *Equisetum arvense*, *Rosa canina*, *Hypericum*

*perforatum*, *Malva silvestris*, *Onionis spinosa*, *Plantago lanceolata*, *Plantago major*, *Taraxacum officinale*, *Tussilago farfara*, *Urtica dioica*, *Delphinium consolida*, *Fumaria officinalis*, *Tanacetum vulgare*, *Saponaria officinalis*, *Prunus spinosa* and the lichen *Pseudevernia prunastri*. Other species of medicinal herbs, such as: *Juglans regia*, *Origanum vulgare*, *Rubus fruticosus*, *Sambucus nigra*. **Mushrooms:** The most common edible species are: *Agaricus arvensis*, *Agaricus campestris*, *Agaricus sylvaticus*, *Amanita caesarea*, *Boletus aereus*, *Boletus reticulatus*, *Calocybe gambosa*, *Cantharellus cibarius*, *Coprinus comatus*, *Craterellus cornucopioides*, *Morchella esculenta*, *Morchella conica*, *Flammulina velutipes*, *Hydnum repandum*, *Lactarius deliciosus*, *Lycoperdon perlatum*, *Macrolepiota procera*, *Marasmius oreades*, *Pleurotus eryngii*, *Russula vesca*, *Suillus granulatus*, *Suillus luteus*, and likely other species as well. Wild fruits, plants and mushrooms for both food and medicine are widely, but patchily, distributed across this unit of analysis and so have many spatial alternatives. The Project could affect this service and can be controlled through proper management actions. Therefore, wild plants and animals used as food and medicine are a no potential priority Ecosystem Services.

**Fisheries.** Fisheries management recognizes a full range of ecosystem services which contributes to communities. There is great interest and a developing passion in Demir Kapija for fishing among many anglers, due to the exceptionally rich and high-quality fish stock in the Demir Kapija region. Here contains catfish, carp, eel, dace, crab, and many other types of fish. The river Dosnica contains numerous trout, and the war waters of the river Bosava provide the perfect habitat for other species. The fish farm at Doshnica has a long tradition of producing trout (rainbow trout and river trout *Salmo trutta fario*). The farm is located in the municipality Demir Kapija, only 5 km away from the main highway E75. The farm has about 2000 m<sup>2</sup> of land and customers purchase over 100 tons of fish each year. Besides this fish farm in the surroundings of Demir Kapija is working the fish farm Akvatika. In this fish farm there is a hatchery for carp and space Demir Kapija (on the river Boshava near the fisheries on the route of the gas pipeline). The gas pipeline is crossing very near Akvatika. Fishery is therefore a priority Ecosystem Service.

**Crop and vineyards.** Ecosystems in the Project Areas provide conditions for growing food. Food comes principally from managed agro-ecosystems. Within the area under the influence of the construction of a gas pipeline, human activities took place and are taking place with different intensity, which left a strong mark on the entire territory, the areas and nature in general. The main activity and land use along the corridor of interest is agriculture, primarily agriculture, and viticulture and fruit growing. The region has excellent climatic conditions for the development of agriculture and especially viticulture. In this region there are about 35% of the total vineyards in the country. Agricultural activities extend along the valleys of the rivers Vardar and Bosava and some of their tributaries and cover the initial and final part of the route. They are characterized by the dominance of agricultural land with small fragments of degraded oak forests and several riparian zones of willows (Vardar and Drenska Reka) and alder (Bosava). The agricultural land is represented by fields, farmlands and vegetable gardens. In addition, there is abandoned agricultural land (uncultivated fields), as well as ruderal vegetation (along the roads, near the villages, etc.) In places where the pipeline passes through agriculturally treated areas, it is necessary the removed humus to be returned for each agricultural parcel separately as it would not the previously established solvency was violated. After this each plot is recultivate. Also, grasslands in the area can be a substantial resource for sheep grazing during summertime when the latter usually exploit shrubs. These grasslands are not very useful per se but they significantly raise the value of the areas during springtime, in the period of sheep breeding, since the grasslands meet the momentary, additional energy and protein needs of sheep. This is also the case with the territory of N. Macedonia where districts comprising the current habitat type are used as winter pastures (Negotino region, Gevgelija region etc). The Project impacts these ecosystem services. Therefore, it is a priority Ecosystem Services.

### 3.5.2 Regulating Services

**Air quality regulation.** Air quality regulation services are the functions and processes that produce clean air and are vital for human health and well-being in the Project area. Well-developed oak- hornbeam forests in the third section (between the villages of Davidovo and Demir Kapija): hilly area (400-950m altitude) is capable of absorbing and releasing gases. Given the dense vegetation, there are alternatives to air quality regulation in the region. The Project does not substantially affect any regulatory mechanisms. Therefore, it is not considered to be a priority Ecosystem Services.

**Regional/local/global climate regulation.** Climate regulation is an important function that provides security to communities through the regulation of natural hazards and promotion of the basic materials for life. At the local and regional scales, changes in land cover can affect both temperature and precipitation. Land disturbance associated with the Project will result in loss of vegetative cover, and dust releases over the construction phase of the Project, but it will not have long-term impact on the local or regional climate. It is not likely to be affected



by the Project. Climate regulation is therefore not considered an Ecosystem Service that the Project is likely to affect, and is therefore not considered a priority Ecosystem Service.

**Water Regulation.** Water regulation services produce clean water that is suitable for human and livestock consumption. Since this is an essential service for life, changes to water quality and quantity directly impact human health and population distribution. Digging a gas pipeline usually does not exceed a depth of 2.0 meters. In the project area, groundwater higher than 2.0 meters can appear at several locations. During the construction, groundwater is expected to appear at the locations near the intersection of the gas pipeline with the rivers (especial Vardar, Kovanska and Stara Reka ) In addition to these locations near the rivers, groundwater is also expected near the following locations app 8+480 and 8+697. Project activities that are likely to impact water and alter the amount or direction of groundwater flow, or that obliterates or alters stream channels can directly impact water quality for this community. Also, the route is passing near reservoir Drenska Reka. The purpose of the reservoir is mainly for irrigation of agricultural areas (vineyards) in the area of the villages Dren and Chiflik, but in addition, it is also used for sports and recreational purposes. These impacts can be modified through proper design, monitoring and other management controls. Water quality is therefore a priority Ecosystem Service.

**Natural hazards regulation.** Natural hazards common to the Project area include droughts, floods, and storms. Droughts and floods are most commonly linked to disasters. The forest communities represented by pseudomakis and downy oak and hornbeam found in the highest part of the route (from 400 to 950 m) are important for protection against erosion and pollution. They are a very common type of vegetation in RNM and important for protection against erosion and pollution. The Ecosystem Services that would mitigate these hazards are large-scale, dependent upon major climatic processes that impact local populations but cannot be controlled. Due to the large spatial and temporal scale this Ecosystem Service operates over, there are few alternatives to this Ecosystem Service. Though this Ecosystem Service is applicable to the community, it does not have the potential to be a priority Ecosystem Service given the lack of impact and control the Project will have over this service.

**Freshwater.** Reliable access to drinking water is essential for the survival of the local population, it depends almost entirely on the ecosystem to provide drinking water. In the Project area, drinking water is provided through a network of wells and water supply systems. In the city of Gjevelija, water supply is provided with six pumping stations (wells), two near the river Vardar and four near the village Moin. The territory of the Municipality of Bogdanci is generally poor with watercourses and springs. An area richer in water is the alluvium of the river Vardar where wells for water supply and irrigation of arable land have also been built. Near the populated area Gjavoto, wells have been built for water supply of the population in Bogdanci and Gjavoto, in addition to the wells as part of the project "Save the Dojran Lake" aimed at providing additional water quantities for the Dojran Lake. The system was built with a capacity of 1,000 l/s, with the basic purpose of supply of additional quantities of water in the Dojran Lake. Demir Kapija has its own water supply system wells about 300m away from the route. The Project is likely to directly and indirectly affect the provision of drinking water, but can influence the magnitude of effect through proper management controls. Since the Project is also reliant upon clean water to support worker communities, this service has the potential to be a priority Ecosystem Service .

**Genetic resources.** This ecosystem service ensures the maintenance of biodiversity which provides ecosystem stability and essential resources for human populations. Since this service is widely available throughout the Region, the project is unlikely to affect local or regional biodiversity. It is therefore not a priority Ecosystem Service and will not be elevated to the screening process.

### 3.5.3 Supporting Services

**Primary productivity.** Primary production is measured by the total photosynthetic output of vegetation and other autotrophic species. The ecosystems in the region are productive, which is essential to both wildlife and livestock production. In addition, the Project is not likely to impact the service. For these reasons, primary productivity is not considered to be a potential priority Ecosystem Service.

**Nutrient capture and recycling.** This supporting service refers to the capacity for ecosystems to capture nutrients from the atmosphere, soils and water, and to recycle these nutrients through biotic or abiotic pathways. The sparse vegetation that grows in the area provides a contribution to nutrient capture and recycling on a global scale, although locally herder livelihoods are largely dependent on traditional pastoral grazing. Since there are other alternatives to nutrient cycling throughout the region and the Project is not likely to impact this service, this is not considered a priority ES.

**Pathways for genetic exchange.** This service is based upon the facilitation of gene flow within and among populations. In the Project area there is a comparative lack of localized, or endemic, species that has been attributed either to frequent immigration among populations, or to the limited duration of time (on an evolutionary scale) that species have had to adapt to this area. While endemic species do occur within the Project Aol, their population boundaries are not confined to it. There are many pathways to genetic exchange in existence and no unique populations. Therefore, because the Project is unlikely to impact this service, this Ecosystem Service will not be analysed closer in the screening process. The local rivers provide important corridors for otters and fish and refuges for amphibians and invertebrates.

### 3.5.4 Cultural Services

Cultural and recreational services are provided throughout the Aol. Details of the cultural areas of significance are briefly reviewed here.

**Cultural sites and events.** Cultural events play an important role in the development of an individual's emotional, cognitive and social development. Four affected municipalities have a lot of traditional spiritual events. The following is a list of some of them:

- Bogoljavljenje Vodici. The day of the baptism of Jesus Christ in the Jordan River, January 19, is celebrated with festive services in the temples in the Municipality and throwing the Holy Cross in the waters in the settlements in the Municipality. The central celebration for the inhabitants of Bogdanci is at the dam Paljurci, for Stojakovo and Selemli - at the dam in Selemli, and for the inhabitants of Gjava - in the river Vardar. In Gevgelija and Negotino also river Vardar.
- The most important day in Project area is St. Trifun (protector of wine-growers). On the feast of the saint of vine-growers, February 14, the vineyards are traditionally pruned, and in honor of the saint the owners of the vineyards prepare festive table, for the blessing of the fruit in the coming year.
- Smokvijada is a traditional festival event held in Gevgelija since 2007. This event in honor of the fig tree is held on the handball court at the City Stadium, starting off with the digestion of sweet figs.

In addition to the opportunities for active recreation and enjoyment of nature, the Region has real archaeological treasures, historical monuments and cultural heritage sites.

Archaeological and cultural sites along the pipeline route are: Gevgelija: Goli Rid, Keramidarnica, Glavica, Golasec, Konjari; Bogdanci: Rudina and Gradiste; Demir Kapija: Ilimov Rid and Orizarski Grobista; Negotino: Bugdaska Glava. The benefits of this ecosystem service predominantly accrue locally. The Project could impact them so this Ecosystem Service is a priority Ecosystem Service.

### Campsites

Careful attention is given to the selection of summer campsites in the Region. Locations are chosen based upon the intersection of multiple ecosystem services, many of which, such as water, are comparatively scarce. AKVATIKA PARK is a picnic place located along the river Boshavica, in the municipality of Demir Kapija. It has a picnic area, designed for everyone who wants to enjoy the beautiful nature, fresh fish, as well as recreational fishing. The picnic area is provided with electricity, water, a place for self-preparation of barbecue and fish, oven, toilets, showers and parking spaces, and is equipped with appropriate cutlery and drinking utensils that are available to visitors. At the same time, Akvatik park is recognizable as a camping place for all lovers of this type of tourism. The Project is likely to indirectly impact this campsite. These effects can be modified through proper management controls. Campsites therefore have the potential to be a priority Ecosystem Service.

**Recreation.** During meetings with local representatives conducted in May 2022, all of them acknowledged that the Region especially Demir Kapija is an outdoors haven for sports and recreational activities. Alpinists, hikers, splonkers, kayakers, and mountain bikers can all find challenging or moderate game amongst the rocks of the Iron Gate. Swimming and wading in local rivers, sitting under shady trees, hiking, and enjoying scenery were all identified. Just before the river Doshnica enters the Demir Kapija valley the river has created natural pools suited for refreshment. The water in the pools is warmed up during the summer months by the sun but also by the accumulated hit of the surrounding rocks/boulders. Places such as Demir Kapija, Beli Raj Miravci, Negorski Banji etc are popular among foreign and domestic visitors. None of these areas will be directly impacted by the Project. Possible temporal impact during construction upon visitors. Recreation is considered to be a priority Ecosystem Service.

**Ecotourism.** There are a few ecotourism facilities that are beginning to become popular within the Aol. Such facilities provide access to ecological resources, lodging, transportation, and guide services for tourists to the

region. Ecotourism benefits the well-being of the local community by encouraging the preservation of local ecological features, and by providing local communities with employment and business opportunities. The long tradition of wine production enables the development of wine tourism. As with recreation, the extent to which the Project will affect this industry is unknown, but the size of the region provides many other opportunities for visitors. This is therefore unlikely to be a priority Ecosystem Service.

### 3.6 Invasive alien species

This section provides supplementary information for potential risks, impacts and mitigation measures related to invasive (alien) species management in accordance with EBRD E&S (2020) policy PR6, as outlined in the due diligence report. It assesses the possibility of accidental transfer and release of alien species and identify measures to minimize the potential for release, if any. This applies to the project's construction and operational phases. It includes new field surveys, a re-evaluation of consequences and mitigating actions, as well as monitoring. Invasive species management will be part of the Biodiversity Action Plan.

The baseline assessment of the invasive species in the ESIA has been supplemented with: data from field visits to identify invasive species in the Aol, risks, impacts and measures. At least five non-native invasive species are known to be present along the route (see table 20).

Table 20. Invasive species

Species	Distribution	Comment
<i>Ailanthus altissima</i> Tree of Heaven [Кисело дрво]	It is distributed in the lowland areas between Negotino and Demir Kapija (60-66+000) as well as between Miravci and border with Greece (0-24+00). It is usually associated with human settlements, agricultural land and ruderal sites.	This invasive species is widespread in North Macedonia. It is forested for erosion prevention.
<i>Robinia pseudoacacia</i> Black locust [Барем]	Along the whole alignment on Marjanska Planina, especially in the valley of Drenska Reka river. (46+600)	Black locust is North American species that was introduced in Europe in 17th century. It is one of the most widely planted woody species in the world and in North Macedonia for erosion prevention, decorative purposes and as a honey plant (Vitkova et al. 2017).
<i>Arundo donax</i> Giant reed [Џиновска трска]	A considerable number of stands were noticed in the area of village Stojakovo (app.4+00).	Giant reed has been planted extensively for erosion control along drainage canals. Very invasive species that impacts the biological corridors for certain species. Available evidence indicates giant reed provides neither food nor habitat for native species of wildlife.
<i>Amorpha fruticosa</i> [Индиго-дрво]	Distributed along river Vardar at the crossing with the gas pipeline (8+500)	Very invasive species in the riparian habitats of large rivers in North Macedonia
<i>Cydalima perspectalis</i> Box tree moth [Шимширов молец]	Large number of individuals of Box tree moth were noticed along in the areas of villages Chiflik (51+000) and Dren (46+600).	During the field surveys in June 2020, hundreds of adult moths of this species were observed. Damage to Box trees ( <i>Buxus sempervirens</i> ) by its larvae were also evident.



Figure 70: *Cydalima perspectalis* near village Dren, 20.06.2021 (photo: S. Hristovski)

### 3.6.1 Risk assessment

The following is risk assessment:

- Potential spread of *Ailanthus altissima*. Its spread as a result of construction and operation of the gas pipeline is **highly unlikely**.
  - Potential spread of *Robinia pseudoacacia*. its spread as a result of construction and operation of the gas pipeline is **highly unlikely**.
  - Potential spread of *Arundo donax*. Its spread as a result of construction and operation of the gas pipeline is **highly unlikely**.
- Potential spread of *Amorpha fruticosa*. This species was recorded at the crossing of river Vardar. The potential to spread its seeds during the construction phase is **possible**, especially if construction works took place during its fruting period (autumn).
- Potential spread of *Cydalima perspectalis*. The Box tree moth is highly invasive species with origin from Asia. Its larvae are feeding on leaves of European box (*Buxus sempervirens*). However, its spread as a result of construction and operation of the gas pipeline is **highly unlikely**.

Invasive non-native species can threaten native species or their habitats, causing ecological damage and damage to economic activities. The reason is in inherently high reproductive rates and consecutive many of introduced species may become invasive, especially if their expansion is not controlled. Additionally, they occupy the habitats of indigenous species and displace them (MoEPP, 2003). The *Amprphpa fruticosa*'s infestations are most prolific in the willow zone, negatively impacting willow-dependent wildlife. Also the plant is said to contain alkaloids and be poisonous to livestock.

The indigo bush is found at chainge 8+500 where the gas pipeline is crossing the river Vardar(fig.71).



Figure 71. *Amorpha fruticosa* in the PZI



### 3.7 Characterization of ecological conditions of water bodies in Vardar river basin

In accordance with the national Law on Waters, as a precondition for starting the implementation of the *Decree on the classification of surface waters* is the adoption of river basin management plans. Due to the fact that the preparation and adoption of the river basin management plans including the one for river Vardar (the project is in river Vardar basin) is in the process of preparation and adoption, no conditions have been created for starting the application of the said decree. Even so, the RNM is working on establishing a monitoring network in accordance with the Water Framework Directive (WFD). Regular monitoring of the water quality of the rivers is enabled by the National Hydrometeorological Service (NHMS). The existing monitoring network, has a total of 17 monitoring stations located in the Vardar river basin, of which water body (WB) 5 -Demir Kapija and WB6 Gevgelija are in the Aol (figure 72).

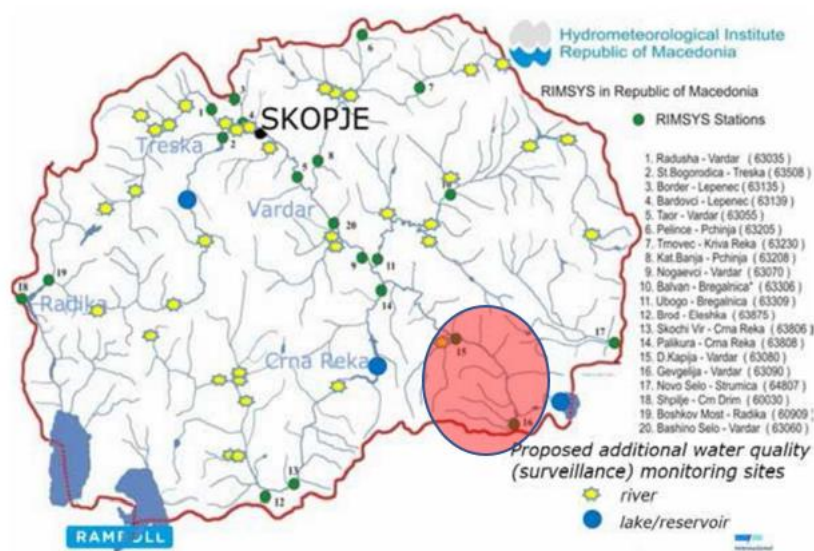


Figure 72. Monitoring station for water quality

The ecological status assessment of the WFD combines information on several hydromorphological, chemical and biological parameters to acquire a comprehensive picture of the overall status on the functioning and structure of the ecosystem (Noges et al., 2009). Based on the digital monitoring platform of NHMS, the following tables are an assessment of the biological, physico- chemical characteristics of river Vardar at Demir Kapija (near the end of the pipeline) and Gevgelija (at the beginning) in the period 2020-2021.

Table 21 .Physico-Chemical status of 2 monitoring points on River Vardar <sup>14</sup>

M.point	Ph	Conductivity	Dissolved Oxygen	BOD5	COD KMnO4	NH4	NO2	NO3	PO4	General Physico-Chemical status	
Demir Kapija	8.08	352.89	167	9.00	5.41	3.53	0.113	0.05	1.47	0.25	M
Gevgelija	8.12	337.56	163	9.32	3.92	3.63	0.09	0.03	1.34	0.23	M

For surface water bodies, ecological status is to be assessed using different assessment methods in accordance with the biological quality elements (BQEs): algae, macrophytes, macroinvertebrates and fish fauna (Arle et al., 2016). Among the BQEs, macroinvertebrates are one of the most commonly used groups in the assessment of the quality of the structure and functioning of surface water ecosystems (Giorgio et al., 2016;

<sup>14</sup> Legend: High ecological status – blue; good-green; moderate-yellow ;poor-orange ;bad-red

Poikane et al., 2016). These organisms present a diverse and generally abundant group with a wide range of environmental tolerances and preferences which can act as long-term indicators of environmental quality (Rosenberg et al., 1993). Macroinvertebrates are found in all aquatic habitats, they are less mobile than most other groups of aquatic organisms, they are easily collected, and most have relatively long periods of development in the aquatic environment. As they are very sensitive to localized pollution loadings (Gresens et al., 2009) they should reflect deleterious events that have occurred in the aquatic environment during any stage of their development (Cairns and Pratt, 1993; Slavevska-Stamenković et al., 2011), fulfilling many of the criteria characterizing the ideal biomonitoring tool (Bonada et al., 2006; Deborde et al., 2016)<sup>15</sup>.

In that order, the following is an attempt to assess the ecological status of river Vardar (at two water bodies) based on macroinvertebrates.

### Demir Kapija - Reka Vardar

Demir Kapija is water body in the Vardar river basin (after the inflow of rivers Doshnica and Boshava) where the analysis of the results obtained during the campaign May / June 2020 showed that there is a relatively low species richness (12 taxa) and EPT taxa (5). The community is represented by macroinvertebrates such as the larvae of *Baetis spp.*, *Potamanthus luteus* (16.3%) (Ephemeroptera), the beta-mesosaprobic larvae of *Hydropsyche* sp. (12.2%) and the larvae of *Cheumatopsyche lepida*. (1.0%) (Trichoptera). Moderately sensitive amphipod *Gammarus roeselii* (5.1) occur within the community, as well as the larvae of Chironomidae from the group *Chironomini* spp (2.0%), *Orthocladinae* spp. (1.0%) and *Tanypodinae* spp. (4.1%). Significant presence of aquatic worms from the group *Oligochaetae* sp. (46.9%) was also recorded. At this time of year, the ecological status based on the applied indices is **moderate**.

The analysis of the results obtained during the October campaign showed that there is a higher species wealth (15 taxa) and EPT taxa (6). The community is represented by macroinvertebrates such as the sensitive larvae of one-day-old *Baetis spp.* (10.8%), *Caenis spp.* (2.7%), *Potamanthus luteus* (1.8%) and *Ephemerella ignita* (4.5%) (Ephemeroptera). Representatives of Chironomidae from the group of *Tanytarsini* spp. (15.3%), *Chironomini* spp. (7.2%) and *Tanypodinae* spp. (22.5%) are part of the community. The presence of moderately sensitive amphipod *Gammarus roeselii* (4.5%) and *Gammarus balcanicus* (2.7%) was also observed, as well as aquatic worms from the group *Oligochaetae* sp. (9.0%). The presence of the more tolerant aquatic snails *Ancylus fluviatilis* and *Acroloxus lacustris* (1.8%) (Gastropoda) is characteristic. Based on the structure of the community and the values of the applied indices, namely SI, ASPT, number of taxa and BMWP, the ecological status of WB\_5 during the campaign in October is assessed as **Good**.

Table 22. Ecological status at two monitoring points on river Vardar based on macroinvertebrates

Index/water body	Demir Kapija May/June	Demir Kapija October	Gevgelija May/June	Gevgelija October
Saprobic Index (German new version)	2.4	2.2	2.3	2.5
ASPT	4.7	6.2	6.2	5
Number of taxa	12	15	13	6
BMWP Score	33	68	62	15
Ecological status	M	G	G	P

### Gevgelija - Vardar River

The analysis of the results of the water body WB Gevgelija (after the inflow of river Stara reka, Kovanska, Sermeninska River, Konska River, Anska Reka and Luda Mara) obtained during the surveyed year 2020 (May / June and October), showed that in the campaign conducted at the end of May and the beginning of June, there is a relatively low diversity of macroinvertebrates (13 taxa) and a low number of EPT taxa (5). The community is represented by the susceptible larvae of *Baetis spp.* (34.3%), *Ephemerella ignita* (8.6%) *Potamanthus luteus* (8.6%) and *Caenis* sp. (8.6%) (Ephemeroptera), as well as representatives of Trichoptera with the larvae of

<sup>15</sup> Donchevska, M. B., Hinić, J., Mitić-Kopanja, D., Ristovska, D., Rebok, K., Paunović, M., & Slavevska-Stamenković, V. (2019). Ecological Status Assessment of the Strumica River Watershed Based on Macroinvertebrates—A Step Towards the Implementation of the EU Water Framework Directive in the Republic of North Macedonia. *Water Research and Management*, 9(3-4), 3-14.

*Hydropsyche contubernalis* (5.7%), and moderately sensitive amphipod *Gammarus roeselii* (5.7%) and *Gammarus balcanicus* (4.3%). The presence of the more tolerant aquatic snails *Ampimelania holandrii* (17.1%), *Theodoxus fluviatilis* (2.9%) and *Theodoxus transversalis* (2.9%) (Gastropoda) was also observed. The presence of aquatic worms from the group Oligochaetae sp. is (5.7%). An important feature of the community is given by the beta-mesosaprobic larvae of the dragonfly *Onychogomphus forcipatus* (1.4%). The ecological status of WB\_6 for this period of the year is **Good**.

In the campaign conducted in October, low macroinvertebrate diversity (6 taxa) and absence of EPT taxa (0) were observed. The water body is also inhabited by tolerant forms, indicative of increased concentrations of nutrients in the water, such as the leech *Erpobdella octoculata* (8.6%), as well as the more tolerant aquatic snails *Amphimelania holandrii* (62.9%), *Theodoxus transversalis* (11.4 %) and *Theodoxus fluviatilis* (5.7%) (Gastropoda). The presence of moderately sensitive amphipod *Gammarus roeseli* (5.7%) and *Gammarus balcanicus* (5.7%) was also observed. Based on the structure of the community and the values of the applied indices, namely SI, ASPT, number of taxa and BMWP, the environmental status of WB\_6 during the month of October is assessed as **Poor**.

As a part of the Twinning project 'Strengthening the Capacities for Effective Implementation of the Acquis in the Field of Water Quality' a Draft Vardar River basin Management Plan has been prepared in 2019 (not officially adopted). The following table is characterisation of Surface Water Bodies in Aol and Risk assessment.

Table 23. Surface Water Bodies and Risk Identification

	River basin km <sup>2</sup>	Monitoring Current status	Final proposed Risk
Demir Kapija	20,865	(not good)	At risk
Boshava Reka	622		Possibly at risk
Doshnica	638		Possibly at risk
Gevgelija	21,743	(not good)	At risk

Due to the intensive agricultural activities in the region, the ecological status of the water bodies is mostly moderate or at risk.

## 4. Critical Habitats Assessment

### 4.1 The CH/PBF Assessment Process

#### 4.1.1 Definition of Critical Habitat and Priority Biodiversity Features

##### Critical Habitat (CH)

Critical habitats are deemed to be the most significant and highest priority areas of the planet for biodiversity conservation. It takes into consideration both global and national priority-setting systems and it builds on the conservation biology principles of 'vulnerability' (degree of threat) and 'irreplaceability' (rarity or uniqueness). There is not any universally accepted or automatic formula whatsoever for deciding on critical habitats; hence, participation of external experts and project specific assessments is paramount, particularly when data are limited. EBRD PR6 (paragraph 14) defines the critical habitat as "the most sensitive biodiversity features" that characteristically comprises one or more of the following:

- (i) highly threatened or unique ecosystems;
- (ii) habitats of significant importance to "endangered" or critically endangered species;
- (iii) habitats of significant importance to endemic or geographically restricted species;
- (iv) habitats supporting globally significant migratory or congregatory species;
- (v) areas associated with key evolutionary processes; or
- (vi) ecological functions that are vital to maintaining the viability of biodiversity features described in this paragraph."

An additional definition of a critical habitat is typically based on quantitative thresholds of biodiversity priority based on precedents such as IUCN Red List criteria, (IUCN, 2012), EU habitats and/or Birds Directives status and Key Biodiversity Area (KBA) thresholds. The aforementioned is elucidated in depth below.

##### Priority Biodiversity Features (PBF)

EBRD PR6 also applies the concepts of vulnerability and irreplaceability to define areas that are still of significant ecological importance often at a regional level although not as globally important as critical habitats. Such areas are referred to as Priority Biodiversity Features (PBF), defined in EBRD PR6 paragraph 12 as "a subset of biodiversity that is particularly irreplaceable or vulnerable, but at a lower priority level than critical habitats". They may include areas that entail the following:

- (i) threatened habitats
- (ii) vulnerable species
- (iii) significant biodiversity features identified by a broad set of stakeholders or governments
- (i) iv) ecological structure and functions necessary to maintain the viability of priority biodiversity features.

#### 4.1.2 The Critical Habitat Assessment Process

Critical Habitat and Priority Biodiversity Feature assessment is the process aimed at identification of those areas of the highest biodiversity value considered especially sensitive to impacts and where particular attention must be paid. The CHA process comprises an initial project screening to identify potential CH/PBF trigger habitats or species present within the area affected by the project. Initial screening is conducted in order to establish trigger features concerning which analysis and verification are to be undertaken.

### 4.2 Screening for CH/PBF

The CH/PBF screening process involved a blend of initial consultations and desktop study. This included usage of a much wider area than just the project itself, followed up by further studies and consultation to verify which CH/PBF "trigger" species or habitats were likely to be actually present in the proposed project area. Consequently, the following potential CH/PBF triggers were deliberated for additional analysis:

- designated sites and other nature conservation areas of recognised national or international significance, alongside the ecological features and species they sustain;



- species and habitats of global, national and/or regional conservation importance including nationally rare, restricted-range and threatened species, globally Critically Endangered or Endangered species (Global and National IUCN Red Lists);
- species included within Annex II and IV of the EU Habitats Directive and Annex I of the Birds Directive;
- other species based on feedback provided by local and international biodiversity experts during the ESIA.

#### 4.2.1 Screening of CH Triggers

On the basis of the ecological baseline assessment studies, the following potential CH Triggers are regarded as applicable to the project:

Table interpretation: GRL - Global IUCN Red List of Threatened Species; ERL - European Red List of Threatened Species; NRL - National Red List of Threatened Species

Criterion	Critical Habitat	
1. Threatened ecosystems - PR6 paragraph 14-i		
EAAA is habitat type listed in Annex 1 of EU Habitats Directive marked as “priority habitat type”	91AA* Eastern white oak woods	<p>A Priority Habitat according to EU HD. Oak forest belt is characterised by a range of forest communities developing in the area. It belongs to the community <i>Querco-Carpinetum orientalis</i>. It comprises the following important species:</p> <ul style="list-style-type: none"><li>— 3 nationally protected species of fungi (<i>Amanita caesarea</i>, <i>Boletus aereus</i>, <i>Craterellus cornucopioides</i>)</li><li>— 1 insect (ground beetle <i>Carabus convexus</i>) listed as Corine species;</li><li>— a number of nesting birds with unfavourable conservation status;</li><li>— 4 amphibians (<i>Rana dalmatina</i>, <i>Pelophylax ridibundus</i>, <i>Hyla arborea</i> and <i>Bufo viridis</i>);</li><li>— 7 reptile species (<i>Zamenis longissimus</i>, <i>Vipera ammodytes</i>, <i>Testudo hermani</i>, <i>Pseudopus apodus</i>, <i>Podarcis erhardii</i>, <i>Lacerta viridis</i>, <i>Dolichophis caspius</i>)</li><li>— 6 mammals EUHDA4 (<i>Dryomys nitedula</i>, <i>Myotis mystacinus</i>, <i>Pipistrellus pygmaeus</i>, <i>Miniopterus schreibersii</i>, <i>Canis lupus</i>, <i>Felis silvestris</i>).</li></ul> <p>It is possibly the most widespread habitat type in the country, which is largely cut and degraded in the project area.</p>
	6220* Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea	<p>A Priority Habitat according to EU HD. It contains hill pastures developing on siliceous substrate and dominated by annual plants. This habitat is not rare in the country, and it occurs in the most arid regions, in thermophile, dry and sundrenched areas. In the pipeline corridor, the habitat is present in several places along the pipeline route, mainly in lowland part, on hilly pastures or near agricultural land. It comprises the following important species:</p> <ul style="list-style-type: none"><li>— 2 Balkan endemic plants (<i>Centaurea grisebachii</i>, <i>Centaurea finnazzeri</i>)</li><li>— 2 amphibian species (<i>Bufo bufo</i> and <i>Bufo viridis</i>) and additionally two more with lower frequency of occurrence</li><li>— Immense diversity of reptiles with 14 important species (<i>Zamenis longissimus</i>, <i>Vipera ammodytes</i>, <i>Testudo hermanni</i>, <i>T. graeca</i>, <i>Pseudopus apodus</i>, <i>Podarcis muralis</i>, <i>P. erhardii</i>, <i>Lacerta viridis</i>, <i>L. trilineata</i>, <i>Malpolon insignitus</i>, <i>Dolichophis caspius</i>, <i>Elaphe quatuorlineata</i>, <i>Coronella austriaca</i>, <i>Anguis fragilis</i>)</li><li>— A number of bird species with the most important nesting birds in this habitat as follows: <i>Alectoris graeca</i>, <i>Coturnix coturnix</i>, <i>Lanius senator</i>, <i>Lanius collurio</i>, <i>Melanocorypha calandra</i>, <i>Calandrella brachydactyla</i>)</li><li>— 2 mammals (<i>Myotis mystacinus</i>, <i>Canis lupus</i>)</li></ul>

Criterion	Critical Habitat	
IUCN Red-List EN or CR ecosystems	EAAA ≥5% of global extent of an ecosystem type with IUCN status of CR or EN	None
EAAA is ecosystem determined to be of high priority for conservation by national systematic conservation planning	Nature Monument - Demir Kapija	The area covers the Demir Kapija Canyon and extends from the populated area Demir Kapija to the village of Udovo in the south. It is characterized by the presence of significant thermophilic communities and hazmophytic vegetation. Interesting riparian vegetation develops in the canyons from the plane-tree communities. Very rare species of plants can be found on the calcareous rocks and stony fields. The area is widely known for its importance for the birds of prey and many Mediterranean species can be found as well. One of the three North Macedonian colonies of griffon vulture, booted eagle, golden eagle, Egyptian vulture, black stork can be found here. Especially noteworthy is the cave fauna of Bela Voda represented by several troglobiont and troglophilic species. Endogean habitats are also known to have several endemic species. The caves are also important because of the bat colonies that can be found in there. Interesting species of invertebrates live in the small tributaries of the river Vardar (Iberian crab, caddisflies, Epallage fatime), and also several species of fish spawn
<b>2. Priority Species and their Habitats - PR6 paragraph 14-ii</b>		
1) EAAA for species and their habitats listed in Annex IV of the Habitats Directive  2) EAAA for important concentrations of a nationally or regionally listed EN or CR species	<b>Mammals</b>	
	<i>Wolf, Canis lupus</i> (GRL- LC, NRL – NT)	The wolf is a common species occurring throughout the country, inhabiting various types of habitats. The wolf is mostly found in the forested mountainous habitats, but occasional presence can also be detected in plains and valleys. The population size in the country is estimated to be 400-1,000 individuals. Although its occurrence was confirmed only at two sites, the wolf is a common species in the area of interest.
	<i>Wild cat, Felis silvestris</i> (GRL- LC)	The wild cat is a common and widespread species that mostly inhabits the forested areas. The population size of wild cat is unknown. Its presence along the pipeline was validated at three sites in Marijanska Planina Mt.
	<i>Euroasian otter, Lutra lutra</i> (GRL- NT, NRL – VU)	The Eurasian otter inhabits most of the existing major water bodies in N. Macedonia. The population size is estimated at 350-400 individuals. Otters are strongly dependent on riparian vegetation and availability of denning sites (holts). Most otter activity occurs in a narrow strip along the water's edge but they may be found up to 1 km away from water. In the broader area of the pipeline corridor, presence of Eurasian otter was recorded at a number of locations along the rivers Vardar, Boshava, Doshnica and Stara Reka
	<i>Schreiber's bent-winged bat (Miniopterus schreibersii)</i> , (GRL- VU)	In the project area, there are 8 bat species in total (all are Annex IV species). The most important is the Schreiber's bent-winged bat (Miniopterus schreibersii). There are no data about the precise distribution and population size in N. Macedonia, but it is deemed widespread. This species favors hardwood forest-rich habitats, and it mainly roosts in colonies in karst caves, mines and cellars with other cave-dwelling species. Along the pipeline corridor, the species was recorded at one location in Demir Kapija

Criterion	Critical Habitat	
	<i>Whiskered bat (Myotis mystacinus)</i>	Whiskered bat ( <i>Myotis mystacinus</i> ) is considered to be widespread in N. Macedonia. It is found in a variety of habitats, including: forests, woodland edge, shrubland, open meadows, wooded landscape near to water, gardens and urban areas. Along the pipeline corridor, the species has been recorded at one location near v. Prdejci.
	<i>Common pipistrelle (Pipistrellus pipistrellus)</i>	Common pipistrelle ( <i>Pipistrellus pipistrellus</i> ) is widespread species throughout the country. It forages in a wide range of habitats, such as open woodlands, over wetlands, farmland, semi-deserts and urban areas. Along the pipeline corridor, the species has been recorded at three locations near v. Bogorodica, v. Gjavato and Demir Kapija.
	<i>Soprano pipistrelle (Pipistrellus pygmaeus), (GRL-LC, ERL-LC)</i>	There are not many data on the distribution of Soprano pipistrelle ( <i>Pipistrellus pygmaeus</i> ) in N. Macedonia. It forages mainly close to riparian forests and waterbodies, as well as in villages and city parks. Along the pipeline corridor, the species has been recorded at one location in Demir Kapija.
	<i>Kuhl's pipistrelle (Pipistrellus kuhlii), (GRL-LC, ERL-LC) and Nathusius' pipistrelle (P. nathusii)</i>	Kuhl's pipistrelle ( <i>Pipistrellus kuhlii</i> ) and Nathusius' pipistrelle ( <i>Pipistrellus nathusii</i> ) are common species in N. Macedonia. Kuhl's pipistrelle is found in both agricultural and urban habitats and is often associated with human settlements. Nathusius' pipistrelle favours habitats of riparian forests, mixed woodlands and often close to waterbodies, but is also found in urban areas. Echolocation calls of both species have been recorded on several locations along the pipeline corridor.
	<i>European free-tailed bat (Tadarida teniotis)</i>	European free-tailed bat ( <i>Tadarida teniotis</i> ) is recorded at only several localities in N. Macedonia. The species occurs in mountainous regions, but also near water, in urban areas and cultivated landscapes. Along the pipeline corridor, the species has been recorded at one location in Demir Kapija.
	<i>Savi's pipistrelle (Hypsugo savii)</i>	Savi's pipistrelle ( <i>Hypsugo savii</i> ) is common and widespread species throughout the country. It forages over open woodland, pasture and wetlands, and often feeds at lights in rural and urban areas. The species has been recorded at two locations between v. Stojakovo and v. Bogorodica.
	<i>Forest dormouse (Dryomys nitedula), (GRL-LC, ERL-LC)</i>	Forest dormouse ( <i>Dryomys nitedula</i> ) is widespread in western parts of N. Macedonia and along Vardar valley. The species mainly prefers forested areas, but also found in rocky areas, evergreen shrubland (including Mediterranean-type shrubland) and wood-steppe. Along the pipeline corridor, the species has been recorded at one location on the right bank of Vardar, near Gevgelija.
	<b>Birds</b>	
	<i>Neophron percnopterus, the Egyptian vulture (GRL- EN)</i>	One pair of Egyptian Vultures is found breeding in Demir Kapija Gorge, in the wider area of the pipeline (outside 2 km corridor), but it uses the project area for foraging. No significant impact is expected on this breeding pair. Five more historically known territories are present in the wider region of Demir Kapija, which are now all unoccupied.
	<b>Amphibians</b>	
	<i>Bombina variegata, fire belly toad (GRL-LC, NRL – LC)</i>	The fire belly toad is Annex II and Annex IV species to the EU Habitat Directive. It is considered abundant in N. Macedonia, with a patchy, fragmented distribution pattern. According to some authors, the subspecies <i>Bombina variegata ssp. scabra</i> is considered endemic in the

Criterion	Critical Habitat	
		Balkans. It occurs in suitable habitats throughout the project area, in temporary and permanent ponds.
	<i>Rana graeca</i> , (GRL- LC, NRL – NT)	The Greek stream frog is an Annex IV species, widespread across the country but it is nevertheless limited to its appropriate habitats of forest and high-mountain streams and rivers. Within the project area, it is normally related to the tributaries of river Vardar, and along the Boshava and Doshnica rivers.
	<i>Rana dalmatina</i> , agile frog (GRL- LC, NRL – NT)	The agile frog is an Annex IV species. It occurs in glades and open sites within light deciduous woodland (oak, beech, hornbeam, etc.), and it is less frequent in meadows and thickets. This species may be found in the meadows near the noteworthy water bodies representing tributaries of river Vardar, as well as along the Boshava and Doshnica rivers.
	<i>Hyla arborea</i> , European tree frog (GRL- LC, NRL – NT)	An Annex IV species, but with a wide distribution, common in suitable habitats in the country. The species is not so widely abundant in the area of interest, and its distribution is associated with larger rivers and springs.
	<i>Bufo viridis</i> , green toad (GRL- LC, NRL – LC)	This species is considered moderately abundant to common over large parts of its range in the country. A couple of monitoring studies from the last four years hint that the species population trends across the country are stable. It is widely abundant throughout the affected area.
	<b>Reptiles</b>	
	<i>Testudo hermanni</i> , Herman's tortoise (GRL- NT, NRL – VU)	An Annex IV and Annex II species to EU Habitat Directive. According to the National Red List of Reptiles of North Macedonia (2021), it is categorised as Vulnerable. The Hermann's tortoise prefers shrubs or openings in thermophilic forests, in our country most often oak or degraded forests of predominantly Jerusalem spine and/or false acacia. In the project area, it is present at lower altitudes (up to 800 m), in hilly and open forest places.
	<i>Testudo graeca</i> , Greek tortoise (GRL- VU, NRL – VU)	An Annex IV and Annex II species to EU Habitat Directive. According to the IUCN Global Red List of Threatened Species and National Red List of Reptiles of North Macedonia (2021), it is categorised as Vulnerable. It is much more thermophilic than the Hermann's tortoise. In the project area, it is present at lower altitudes with a preference for open habitats of small bush and shrub, degraded secondary growth habitats or sandy slopes, rather than forests.
	<i>Lacerta trilineata</i> , the Balkan green lizard (GRL- LC, NRL – LC)	The Balkan green lizard occurs in a broad range of habitats, usually with plenty of vegetation, such as forest edges, open woods, hedgerows along roads and paths, scrubland, overgrown fields, and gardens. It is widely dispersed in the country as well as in the project area at lower altitudes (up to 1,200 meters) on hilly and open forest sites.
	<i>Lacerta viridis</i> , green lizard (GRL- LC, NRL – LC)	The green lizard is a ubiquitous species in N. Macedonia, present in many habitats and localities, and it can be found within the boundaries of or around man-made habitats. It is very common in the country and in the project area at lower altitudes (up to 1,200 meters) in hilly and open forest locations.
	<i>Podarcis muralis</i> , the common wall lizard (GRL- LC, NRL – LC)	An Annex IV species, but with a wide distribution, tolerance of a broad range of habitats, presumed large population. The common wall lizard is a ubiquitous species in N. Macedonia, present in scores of habitats and



Criterion	Critical Habitat	
		localities, and it is one of the most successful species in man-made habitats. It is widely distributed in the project area.
	<i>Dolichophis caspius</i> , the Caspian whip snake (GRL- LC, NRL – LC)	The Caspian whip snake is found in dry areas of open scrubland and woodland, steppe and other grasslands, rocky hillsides, overgrown areas, vineyards, rural gardens, stone walls, and ruins. It is extensively distributed in the country as well as in the project area at lower altitudes (up to 900 m) in meadows, and on hilly sites.
	<i>Coronella austriaca</i> , smooth snake (GRL- LC, NRL – LC)	An Annex IV species, but with a wide distribution, tolerance of a broad range of habitats. It is the most common in upland or montane areas, and overall in hilly terrain. In the project area, it occupies various habitats from the plains all the way to forest areas and stony peaks.
	<i>Zamenis longissimus</i> , the Aesculapian snake (GRL- LC, NRL – LC)	The Aesculapian ratsnake is widely distributed in the country. It is by and large found in arid, open woodlands, forested ravines, rocky outcrops, field edges, orchards, stone walls, and old buildings. In the project area, it occurs in forest and riparian belts.
	<i>Natrix tessellata</i> , dice snake (GRL- LC, NRL – LC)	The dice snake is widely distributed in North Macedonia. It is highly aquatic, nearly always found close to or in bodies of water. It tends to occupy larger water bodies when it coexists with grass snake. Within the project area, it is habitually connected to greater rivers, such as the river Vardar, the Boshava and Doshnica rivers.
	<i>Vipera ammodytes</i> , the nose-horned viper (GRL- LC, NRL – LC)	The nose-horned viper is very widespread in the country. This species is associated with rocky areas but it tends to be opportunistic in other habitats. It occurs in dry, often rocky habitats, including open woodland and scrub, sand dunes, hillsides, screes, stone walls, traditionally cultivated land, etc. It equally favours man-made or natural rock formations. This species is also broadly dispersed in the project area, occupying various habitats.
	<b>Invertebrates</b>	
	<i>Zerynthia polyxena</i> , The southern Festoon.	The southern Festoon ( <i>Zerynthia polyxena</i> ) is a butterfly species listed in Annex IV of the EU Habitats Directive. In North Macedonia, it is distributed throughout the country with most of the records in the valley or rivers Crn Drim, Treska, Crna Reka, Kriva Reka and Vardar. It inhabits meadow, especially along rivers as well as forest clearings. Only one specimen was observed in a oak forest clearing at the locality Manastirska Cuka which is cca 4 km away from the pipeline (outside of any project impact).
EAAA supports ≥ 0.5% of the global population AND ≥ 5 reproductive units of a CR or EN species	<i>Helix philibinensis</i> (GRL-LC; south-Balkan endemic)	<i>Helix philibinensis</i> is only known from a small area in the Central Balkan, from the region around the Ohrid Lake to the east as far as the Island of Thasos. Interestingly, it inhabits a wide range of habitats, from the lowlands up to mountain peaks which reach almost 2000 m altitude. In the area of interest, it was recorded in dry grasslands (6220* Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea), between Negotino and Demir Kapija. Common species in these habitat types in the whole Vardar valley. Its AOO is estimated at 80km <sup>2</sup> , while EOO is 40000km <sup>2</sup> (Páll-Gergely 2011)
EAAA supports globally significant population of VU species necessary to prevent a change of IUCN Red List status	None	

Criterion	Critical Habitat
to EN or CR, and satisfies threshold	

#### 4.2.2 Screening of PBF Triggers

The following potential PBF Triggers have been identified based on Table 2 of the EBRD PR6 Guidance Note:

Criterion	Priority Biodiversity Feature	
1. Threatened ecosystems - PR6 paragraph 12-i		
EAAA is habitat type listed in Annex 1 of EU Habitats Directive or Resolution 4 of Bern Convention	6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco brometalia) (*important orchid sites)	1 habitat of pan-European interest, listed in Annex I to the HD, but widespread in Macedonia; 6 plant species of biogeographical significance; 3 fungal species, 1Least Concern (GRL); 1 Near Threatened (NRL); 1 new for the country; 1 regionally endemic insect (ground beetle); 3 nesting birds with unfavourable conservation status: 2 are Least Concern and 1 is Near Threatened (GRL and ERL); all are EUBDA1; 2 Least Concern reptiles (snakes) (GRL, ERL and NRL), EUHDA4. 4 mammals EUHDA2; EUHDA4; all are Least Concern (GRL and ERL); The current habitat is largely distributed in the country. The plant communities affiliated with this habitat type are secondary phytocoenoses derived from permanent degradation of forest associations, particularly in the oak belt.
	92A0 Salix alba and Populus alba galleries	1 habitat of pan-European interest, listed in Annex I to the HD, but widespread in N. Macedonia. The riparian willow-poplar belt is present at the point where the pipeline traverses the river Vardar. In the willow and poplar belt, the False indigo-bushtree occurs at a number of spots as an invasive species.
	92C0 Platanus orientalis and Liquidambar orientalis woods	1 habitat of pan-European interest, listed in Annex I to the HD, but widespread in N. Macedonia. The riparian willow-poplar belt is present at the point where the pipeline traverses the streams Drenska Reka, Gabreshka Reka, Zuica, Doshnica, Boshava and Kovanska Reka
	Rivers and streams (3260)	1 habitat of Pan-European interest in an average condition; Presence of the restricted-range Danube barbel ( <i>Barbus balcanicus</i> ) is both categorised in Annex II and Annex V to the Habitat Directive. The European otter, near threatened (NT) in Europe and the Mediterranean Basin, EUHDA2, EUHDA4.
EAAA < 5% of the global extent of an <i>ecosystem</i> type with IUCN status of CR or EN	- None	
2. Priority Species and their Habitats - PR6 paragraph 12-ii		
1) EAAA supports VU species	Birds	
	IUCN VU species	
	Aquila heliaca, Imperial eagle (GRL- VU; ERL – LC)	One pair of Imperial Eagles used to breed on a pylon in vicinity of Negotino (Dubrovo). The pair is not present for the last two years, but it cannot be excluded that it has changed breeding location and is still present in the region. Non-breeding birds are occasionally observed in the southern parts

2) EAAA for species and their habitats listed in Annex II of Habitats Directive, Annex I of Birds Directive, or Resolution 6 of Bern Convention		of the project region, during dispersion/migration. Temporary habitat loss/disturbance are likely to affect eventually breeding birds.
	<i>Streptopelia turtur</i> , the European turtle dove (GRL- VU; ERL – VU)	The Turtle Dove is common breeding bird species in the area of interest, with densities from 2 pa/km <sup>2</sup> , but locally reaching up to 7 pa/km <sup>2</sup> . Although point data are shown, it is actually present along the entire pipeline corridor. Although the European population is in steep decline, Macedonian breeding population still seems stabile (or experiencing smaller decline). It will be affected by habitat loss and disturbance. On short term, but ground clearing will provide new feeding possibilities in the overgrown habitats. No specific mitigation measures might be implemented.
	<i>Bird Directive Annex I species</i>	
	<i>Alectoris graeca</i> , the rock partridge (GRL- NT; ERL- NT)	The Rock Partridge is an common species in rocky and scrubby areas in North Macedonia, and although it has been only sporadically registered in the study area, it should be regarded as more common. The effect from the project implementation will be small to negligible.
	<i>Apus apus</i> , (GRL- LC; ERL-NT)	The Common Swift has decline populations throughout Europe, but its national situation is not well known. It is connected to urban centers for breeding and is an aerial hunter, and therefore will not be affected by the project implementation.
	<i>Coturnix coturnix</i> , (GRL- LC; ERL- NT)	The Quail is another species declining in Europe, related to arable land and pastures. It has good populations in the southern part of the project areas (Gevgelija fields), about 2 pa/km <sup>2</sup> , that will be affected by the project implementation. The effects will be temporary and the population is expected to recover within one-two breeding seasons.
	<i>Caprimulgus europaeus</i> , the European nightjar (GRL- LC; ERL- LC)	The Nightjar is common species in the woodland habitats along the pipeline (densities of about 1 pa/km <sup>2</sup> ) and its habitat will be affected on a medium-scale timeline, until the surface vegetation is recovered. No specific mitigation measures are possible, except avoiding the construction activities in the breeding period (April-June) to minimize disturbance and nest losses, which is general proposed measure.
	<i>Ciconia ciconia</i> the white stork (GRL- LC; ERL-LC)	The White Stork is one of the triggering species for identification of the IBA Southern Vardar, and has good populations in the villages Bogorodica and Stojakovo in Gevgelija region (about 60 pairs breed in this region, (Putilin, Stamkoska et al. 2020). The pipeline is foreseen to pass through feeding areas near Stojakovo (Gevgelija), and season restrictions Mar-Aug. are needed.
	<i>Ciconia nigra</i> , the black stork, (GRL- LC; ERL-LC)	The Black Stork breeds in Demir Kapija Gorge and uses Vardar river and its tributaries for foraging. During migration it can be expected along the entire corridor. It is highly sensitive to disturbance and habitat loss, but no nest is known in the vicinity of the corridor.
	<i>Ixobrychus minutus</i> , (GRL- LC; ERL-LC)	Few pairs of the Little Bittern might be breeding in the sections of Lower Vardar river, where reed-beds exist. It will not be significantly affected by the construction of the pipeline.
	<i>Circaetus gallicus</i> , the short-toed snake eagle (GRL- LC; ERL-LC)	The Short-toed Snake-eagle is common species in the Mediterranean woodland, especially on calcareous substrate, and several pairs (at least five) are found along the project corridor. They will be adversely affected by the pipeline construction, which will cause some disturbance and especially (foraging) habitat loss, which might reflect on the breeding success. These negative effects are expected to be of temporary nature, and their effects will likely become negligible within several years.
	<i>Circus pygargus</i> , Montagu's harrier (GRL- LC; ERL- LC)	One or two pairs of Montagu's Harriers breed in the field near Gevgelija, and will be temporary affected by the construction work (both disturbance and habitat loss). Under assumption that agriculture habitat will be restored anyway, avoidance of construction work between May 1st and July 30th is the only possible mitigation measure.
	<i>Coracias garrulus</i> , the European roller (GRL- LC; ERL- LC)	Few pairs of Rollers scarcely breed in the riparian forests in Lower Vardar section. It might be affected only locally, near Gevgelija, if large poplar or plane trees are fallen for the project implementation. Therefore, as a mitigation measure, this practice should not be allowed (which will have positive impact for other species as well).

<i>Dendrocopos medius</i> , the middle-spotted woodpecker (GRL-LC; ERL-LC)	The Middle Spotted Woodpecker in the study area is connected with the riparian forests, and will be insignificantly affected by the project implementation. Its population seems already depleted in the pipeline corridor.
<i>Dendrocopos syriacus</i> , the Syrian woodpecker (GRL-LC; ERL-LC)	The Syrian Woodpecker is connected to orchards and is very common species in North Macedonia. Effects on its population from the project implementation will be negligible and temporary.
<i>Emberiza hortulana</i> , Ortolan (GRL-LC; ERL-LC)	The Ortolan Bunting is locally common species in Macedonia, and also along the project corridor. It is not expected to be significantly impacted by the project implementation, and the effects are going to be only temporary.
<i>Falco naumanni</i> , (GRL-LC; ERL-LC)	The Lesser Kestrel is one of the trigger species for the IBA Tikvesh Region. Its population in the pipeline corridor still seems to be strong (estimated to about 40 pairs), and will be negatively affected by habitat destruction (loss of foraging areas). This will lead to decline in the breeding success. Mitigation measures should include avoidance of the construction works in the pastures between April 1st and July 15th, and also reduction of other threats, as the likely electrocution on dangerous electricity poles in the region, which might be insulated as a compensatory measure.
<i>Falco peregrinus</i> , (GRL-LC; ERL-LC)	One pair of Peregrines breed in the wider area of the pipeline, in Demir Kapija Gorge, and individual birds are observed in the fields of Gevgelija in the breeding season. It will not be significantly impacted by the project implementation.
<i>Lanius collurio</i> , the red-backed shrike (GRL-LC; ERL-LC)	The Red-backed Shrike is common species in the habitats with bushes in North Macedonia and along the project corridor. Its population will be directly affected by habitat loss, but not substantial mitigation measures can be proposed.
<i>Lanius minor</i> , the lesser grey shrike (GRL-LC; ERL-LC)	The Lesser Grey Shrike is locally present along the pipeline corridor. Effects on its population are going to be temporary only. The national population is quite strong.
<i>Lanius senator</i> , (GRL-LC; ERL-NT)	The Woodchat Shrike is common and widespread species in the open woodlands and bushes and in the arable habitats along the project corridor (reaching 3-4 pa/km <sup>2</sup> ) and in North Macedonia. The European populations are declining. Although the project implementation will cause temporary habitat loss, the population will recover and will benefit from the newly-established open areas along the pipeline.
<i>Lullula arborea</i> , the woodlark (GRL-LC; ERL-LC)	Some habitat loss is expected to affect the local population of the Woodlark, but the species is common and abundant in the appropriate habitats elsewhere in North Macedonia.
<i>Accipiter brevipes</i> , (GRL-LC; ERL-LC)	The Levant Sparrowhawk is typical bird of prey for the Lower Vardar region (both Demir Kapija and Gevgelija) and its area is the core of its population in North Macedonia. The national population is small, possibly no more than 60 pairs. It breeds in the riparian forests, and some pairs will likely be affected by habitat loss and disturbance. Therefore, minimal destruction of the riparian forest should be secured throughout pipeline construction, both at Boshava-Doshnica rivers and at Lower Vardar.
<i>Alcedo atthis</i> , (GRL-LC; ERL-LC)	Few pairs possibly breed along Vardar river in Gevgelija region, and might be locally affected by disturbance. Destruction of steep banks along the river, where this species breed (and the Sand Martin Riparia riparia have colonies) should not be allowed during project implementation.
<i>Aquila chrysaetos</i> , (GRL-LC; ERL-LC)	Active nest of one pair of Golden Eagles exist along one of the proposed alternatives of the pipeline (at Vrvot) and this alternative is to be abandoned. The construction will cause habitat loss and disturbance to this breeding pair, but the effect is expected to be temporary.



<i>Bubo bubo</i> , (GRL-LC; ERL-LC)	At least one territory of Eagle Owls is known in the project corridor, but the species is likely more common. Temporary disturbance and habitat loss are expected, but no significant impact in long term.
<i>Buteo rufinus</i> , (GRL-LC; ERL-LC)	Two to four pairs of Long-legged Buzzard are to be found along the project corridor, but will unlikely be affected by the project implementation, as they benefit from open habitats. Nest are not near to the projected corridor.
<i>Curruca nisoria</i> , (GRL-LC; ERL-LC)	The Barred Warbler is locally found in the project corridor, and its national population will be insignificantly affected by the project implementation.
<i>Gyps fulvus</i> , (GRL-LC; ERL-LC)	Colony of the Griffon Vultures exist near the project corridor (above village Klisura, Demir Kapija), and one of the pipeline alternatives passes very close to the colony (at locality Vrvot). This alternative is to be avoided. The other alternative, due the topography of the terrain, will not be affect the colony. Although birds from the colony rarely use the corridor area for foraging, they will not be significantly affected by habitat loss and disturbance.
<i>Hieraaetus pennatus</i> , (GRL-LC; ERL-LC)	Two to three pairs of Booted Eagles are to be found in the forests between Dren and Gabrovo, and one-two more around Stojakovo village. The construction will cause habitat loss and disturbance for this rare bird of prey which requires mature forest stands for breeding. Mitigation measures should include avoidance of the forest stands and avoidance of the construction work in the period March 15th – July 31st in the breeding areas for this species.
<i>Melanocorypha calandra</i> , (GRL-LC; ERL-LC)	The Calandra Lark is locally abundant in the fields near Negotino and Gevgelija, and will be affected by habitat loss. Effects are going to be temporary and the population will recover within 2 years.
<i>Milvus migrans</i> , (GRL-LC; ERL-LC)	One or two pairs of the extremely rare Black Kite breed in the wider region of Demir Kapija, but will unlikely be affected by the project implementation as it is related to preserved forest stands which are not to be found along the project corridor. It however forages in sections of the pipeline corridor, so, some negative effect is still to be expected.
<i>Calandrella brachydactyla</i> , (GRL-LC; ERL-LC)	The Short-toed Larks locally breeds in the regions of Negotino and Gevgelija, but its main national strongholds are in the central and dry parts of North Macedonia, thus the project will have insignificant negative effect on the national population, which will also be temporary.
<i>Pernis apivorus</i> , (GRL-LC; ERL-LC)	One pair of Honey Buzzard probably breeds in the in the Lower Vardar region, and will likely be unaffected with the construction works.
<i>Sternula albifrons</i> , the Little Tern (GRL-LC; ERL-LC) and <i>Sterna hirundo</i> , the Common Tern, (GRL-LC; ERL-LC)	Lower Vardar region is the only known breeding site for these Annex I species - the Little Tern and the Common Tern in North Macedonia, and will therefore require protection. mixed colony is located on a small island near village Gjavato, about 2 km from the foreseen project pipeline. The colony is about 30 pairs in total, equally divided between both species. Construction will cause foraging habitat loss and disturbance. Ideally, construction activities should be implemented in the period between August and March, to avoid any impact on the colony. Breeding on other river islands cannot be excluded. Therefore, no alterations in the river bed are to be made with the construction works.
<b>Fish</b>	
<i>Danube barbel</i> , <i>Barbus balcanicus</i> (GRL – LC)	<i>Barbus balcanicus</i> is both categorised in Annex II and Annex V. In the Global Red List (IUCN), in addition to in the European and the Mediterranean Red Lists, the Danube barbell is categorised as a Least Concern species (LC). It is a range restricted, but common fish in the Vardar watershed.
<b>Insects</b>	
<i>Morimus funereus</i> , the long-horned beetle (GRL – NT)	The longhorn beetle <i>Morimus funereus</i> is a saproxylic insect (Coleoptera, Cerambycidae) listed in Annex II of the EU Habitat Directive. It is also considered as Vulnerable species (VU) on the global IUCN red list of threatened species. It has dominantly European distribution. <i>Morimus funereus</i> inhabits well preserved forest ecosystem in North Macedonia with

		preference to oak forests, however it frequently occurs in riparian and beech forests. During the survey in 2022, only one specimen was recorded in the riparian forest [92C0: Platanus orientalis and Liquidambar orientalis woods (Platanion orientalis)] at the confluence of the rivers Doshnica and Boshava.
<b>3. Range-restricted species - PR6 paragraph 12-ii</b>		
EAAA for regularly occurring range-restricted species	None	
<b>4. Migratory and congregatory species - PR6 paragraph 12-ii</b>		
EAAA identified per Birds Directive or recognized national or international process as important for migratory birds (esp. wetlands)	None	
<b>5. Significant biodiversity features identified by a broad set of stakeholders or governments - PR6 paragraphs 12-iii</b>		
IBA Tikves region	The area is important because of the presence of two Egyptian vultures ( <i>Neophron percnopterus</i> ) in its southern part, and also because of the presence of 230 to 250 nesting pairs of the lesser kestrel ( <i>Falco naumanni</i> ), which is nesting only in the villages and it is present in the northern part of the area. In the northern part of the area, 1-2 pairs of imperial eagle ( <i>Aquila heliaca</i> ) are nesting, as well as at least one pair of lanner falcon ( <i>Falco biarmicus</i> ). Also, the largest colony (60 to 90 pairs) of grey heron ( <i>Ardea cinerea</i> ) exists in this region. The line gas pipeline corridor penetrates more than 10 KM in the area (point KM 57+000).	
IBA Demir Kapija Gorge	The Demir Kapija Canyon is one of the richest ornithological reserves in Europe by the presence of rare birds of prey: griffon vulture ( <i>Gyps fulvus</i> ), Egyptian vulture ( <i>Neophron percnopterus</i> ), golden eagle ( <i>Aquila chrysaetos</i> ), short-toed snake eagle ( <i>Circaetus gallicus</i> ), long-legged buzzard ( <i>Buteo rufinus</i> ), various falcons ( <i>Falco peregrinus</i> , <i>F. naumanni</i> ), as well as some less common species of birds such as <i>Hieraaetus pennatus</i> , <i>Milvus migrans</i> , <i>Falco biarmicus</i> , <i>Cerchotrichas galactotes</i> etc. The gas pipeline corridor intersects the area between KM 47+250 to KM 48+800 and from KM 50+800 to KM 52+250, in the total length of 3 KM.	
IBA Lower Vardar	The area has been identified as an important area for nesting of two species of terns ( <i>Sterna hirundo</i> and <i>Sternula albifrons</i> ), as a nesting area of almost 10% of the national white stork population ( <i>Ciconia ciconia</i> ) and as a potential bottleneck for migration of large floating species of birds (birds of prey, storks, etc.) In addition, the flood meadow of the Gjol area (in the vicinity of the village of Bogorodica) is an important stop-over site for many wintering species in this part of North Macedonia. This includes several species of duck and egret families, and the greater flamingo ( <i>Phoenicopterus roseus</i> ) has been spotted on several occasions. Also, this locality is crucial in the feeding of the breeding non-resident species such as the large nesting populations of white storks in the villages of Stojakovo and Bogorodica. The line gas pipeline corridor intersects the area between KM 0+000 and KM 9+500 and KM 10+500 and KM 13+000, in the total length of 12 KM.	

## 4.3 Analysis: Designated Sites and Notable Habitats and Species

The following table depicts a CH/PBF analysis regarding the prominent species ascertained during the initial screening process.

### 4.3.1 Analysis of Potential Critical Habitats

#### Potential Critical Habitat/PBF Triggers: Highly Threatened or Unique Ecosystems

Species	Status within Broader Area of Analysis	Status
Priority habitats according to EU Habitat Directive		
91AA* Eastern white oak woods	<p>A Priority Habitat according to EU HD. Oak forest belt is characterised by a range of forest communities developing in the area. It belongs to the community <i>Quercus-Carpinetum orientalis</i>. It comprises the following important species:</p> <p>3 nationally protected species of fungi (<i>Amanita caesarea</i>, <i>Boletus aereus</i>, <i>Craterellus cornucopioides</i>)</p> <p>1 insect (ground beetle <i>Carabus convexus</i>) listed as Corine species;</p> <p>a number of nesting birds with unfavourable conservation status;</p> <p>4 amphibians (<i>Rana dalmatina</i>, <i>Pelophylax ridibundus</i>, <i>Hyla arborea</i> and <i>Bufo viridis</i>);</p> <p>7 reptile species (<i>Zamenis longissimus</i>, <i>Vipera ammodytes</i>, <i>Testudo hermanni</i>, <i>Pseudopus apodus</i>, <i>Podarcis erhardii</i>, <i>Lacerta viridis</i>, <i>Dolichophis caspius</i>)</p> <p>6 mammals EUHDA4 (<i>Dryomys nitedula</i>, <i>Myotis mystacinus</i>, <i>Pipistrellus pygmaeus</i>, <i>Miniopterus schreibersii</i>, <i>Canis lupus</i>, <i>Felis silvestris</i>).</p> <p>It is possibly the most widespread habitat type in the country, which is largely cut and degraded in the project area.</p>	CH
6220* Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea	<p>A Priority Habitat according to EU HD. It contains hill pastures developing on siliceous substrate and dominated by annual plants. This habitat is not rare in the country, and it occurs in the most arid regions, in thermophile, dry and sun-drenched areas. In the pipeline corridor, the habitat is present in several places along the pipeline route, mainly in lowland part, on hilly pastures or near agricultural land. It comprises the following important species:</p> <p>2 Balkan endemic plants (<i>Centaurea grisebachii</i>, <i>Centaurea finnazzeri</i>)</p> <p>2 amphibian species (<i>Bufo bufo</i> and <i>Bufo viridis</i>) and additionally two more with lower frequency of occurrence</p> <p>Immense diversity of reptiles with 14 important species (<i>Zamenis longissimus</i>, <i>Vipera ammodytes</i>, <i>Testudo hermanni</i>, <i>T. graeca</i>, <i>Pseudopus apodus</i>, <i>Podarcis muralis</i>, <i>P. erhardii</i>, <i>Lacerta viridis</i>, <i>L. trilineata</i>, <i>Malpolon insignitus</i>, <i>Dolichophis caspius</i>, <i>Elaphe quatuorlineata</i>, <i>Coronella austriaca</i>, <i>Anguis fragilis</i>)</p> <p>A number of bird species with the most important nesting birds in this habitat as follows: <i>Alectoris graeca</i>, <i>Coturnix coturnix</i>, <i>Lanius senator</i>, <i>Lanius collurio</i>, <i>Melanocorypha calandra</i>, <i>Calandrella brachydactyla</i>)</p> <p>2 mammals (<i>Myotis mystacinus</i>, <i>Canis lupus</i>)</p>	CH
Areas recognized as priorities in official regional or national plans, such as National Biodiversity Strategy and Action Plans		
Nature Monument - Demir Kapija	<p>The area covers the Demir Kapija Canyon and extends from the populated area Demir Kapija to the village of Udovo in the south. It is characterized by the presence of significant thermophilic communities and hazmophytic vegetation. Interesting riparian vegetation develops in the canyons from the plane-tree communities. Very rare species of plants can be found on the calcareous rocks and stony fields. The area is widely known for its importance for the birds of prey and many Mediterranean species can be found as well. One of the three North Macedonian colonies of griffon vulture, booted eagle, golden eagle, Egyptian vulture, black stork can be found here. Especially noteworthy is the cave fauna of Bela Voda represented by several troglobiont and troglophilic species. Endogean habitats are also known to have several endemic species. The caves are also important because of the bat colonies that can be found in there. Interesting species of invertebrates live in the small tributaries of the river Vardar (Iberian crab, caddisflies, Epallage fatime), and also several species of fish spawn</p>	CH

Table interpretation: EUHDA1: EU Habitat Directive Annex1; EUHDA2: EU Habitat Directive Annex 2; EUHDA4: EU Habitat Directive Annex 4; EUBDA1: EU Bird Directive Annex 1.

## Potential Critical Habitat/PBF Triggers: IUCN Critically Endangered and Endangered Species or Habitats IV Species

Species	Status within Broader Area of Analysis	Status
Mammals		
Wolf, <i>Canis lupus</i> (GRL- LC, NRL – NT)	The wolf is a common species occurring throughout the country, inhabiting various types of habitats. The wolf is mostly found in the forested mountainous habitats, but occasional presence can also be detected in plains and valleys. The population size in the country is estimated to be 400-1,000 individuals. Although its occurrence was confirmed only at two sites, the wolf is a common species in the area of interest.	CH
Wild cat, <i>Felis silvestris</i> (GRL- LC)	The wild cat is a common and widespread species that mostly inhabits the forested areas. The population size of wild cat is unknown. Its presence along the pipeline was validated at three sites in Marijanska Planina Mt.	CH
Euroasian otter, <i>Lutra lutra</i> (GRL- NT, NRL – VU)	The Eurasian otter inhabits most of the existing major water bodies in N. Macedonia. The population size is estimated at 350-400 individuals. Otters are strongly dependent on riparian vegetation and availability of denning sites (holts). Most otter activity occurs in a narrow strip along the water's edge but they may be found up to 1 km away from water. In the broader area of the pipeline corridor, presence of Eurasian otter was recorded at a number of locations along the rivers Vardar, Boshava, Doshnica and Stara Reka	CH
Schreiber's bent-winged bat ( <i>Miniopterus schreibersii</i> ), (GRL-VU)	In the project area, there are 8 bat species in total (all are Annex IV species). The most important is the Schreiber's bent-winged bat ( <i>Miniopterus schreibersii</i> ). There are no data about the precise distribution and population size in N. Macedonia, but it is deemed widespread. This species favors hardwood forest-rich habitats, and it mainly roosts in colonies in karst caves, mines and cellars with other cave-dwelling species. Along the pipeline corridor, the species was recorded at one location in Demir Kapija	CH
Whiskered bat ( <i>Myotis mystacinus</i> )	Whiskered bat ( <i>Myotis mystacinus</i> ) is considered to be widespread in N. Macedonia. It is found in a variety of habitats, including: forests, woodland edge, shrubland, open meadows, wooded landscape near to water, gardens and urban areas. Along the pipeline corridor, the species has been recorded at one location near v. Prdejci.	CH
Common pipistrelle ( <i>Pipistrellus pipistrellus</i> )	Common pipistrelle ( <i>Pipistrellus pipistrellus</i> ) is widespread species throughout the country. It forages in a wide range of habitats, such as open woodlands, over wetlands, farmland, semi-deserts and urban areas. Along the pipeline corridor, the species has been recorded at three locations near v. Bogorodica, v. Gjavato and Demir Kapija.	CH
Soprano pipistrelle ( <i>Pipistrellus pygmaeus</i> ), (GRL- LC, ERL-LC)	There are not many data on the distribution of Soprano pipistrelle ( <i>Pipistrellus pygmaeus</i> ) in N. Macedonia. It forages mainly close to riparian forests and waterbodies, as well as in villages and city parks. Along the pipeline corridor, the species has been recorded at one location in Demir Kapija.	CH
Kuhl's pipistrelle ( <i>Pipistrellus kuhlii</i> ), (GRL-LC, ERL-LC) and Nathusius' pipistrelle ( <i>P. nathusii</i> )	Kuhl's pipistrelle ( <i>Pipistrellus kuhlii</i> ) and Nathusius' pipistrelle ( <i>Pipistrellus nathusii</i> ) are common species in N. Macedonia. Kuhl's pipistrelle is found in both agricultural and urban habitats and is often associated with human settlements. Nathusius' pipistrelle favours habitats of riparian forests, mixed woodlands and often close to waterbodies, but is also found in urban areas. Echolocation calls of both species have been recorded on several locations along the pipeline corridor.	CH
European free-tailed bat ( <i>Tadarida teniotis</i> )	European free-tailed bat ( <i>Tadarida teniotis</i> ) is recorded at only several localities in N. Macedonia. The species occurs in mountainous regions, but also near water, in urban areas and cultivated landscapes. Along the pipeline corridor, the species has been recorded at one location in Demir Kapija.	CH
Savi's pipistrelle ( <i>Hypsugo savii</i> )	Savi's pipistrelle ( <i>Hypsugo savii</i> ) is common and widespread species throughout the country. It forages over open woodland, pasture and wetlands, and often feeds at lights in rural and urban areas. The species has been recorded at two locations between v. Stojakovo and v. Bogorodica.	CH
Forest dormouse ( <i>Dryomys</i> )	Forest dormouse ( <i>Dryomys nitedula</i> ) is widespread in western parts of N. Macedonia and along Vardar valley. The species mainly prefers forested areas, but also found in rocky areas, evergreen shrubland (including Mediterranean-type shrubland) and wood-	CH



Species	Status within Broader Area of Analysis	Status
nitedula), (GRL-LC, ERL-LC)	steppe. Along the pipeline corridor, the species has been recorded at one location on the right bank of Vardar, near Gevgelija.	
Birds		
Neophron percnopterus, the Egyptian vulture (GRL- EN)	One pair of Egyptian Vultures is found breeding in Demir Kapija Gorge, in the wider area of the pipeline (outside 2 km corridor), but it uses the project area for foraging. No significant impact is expected on this breeding pair. Five more historically known territories are present in the wider region of Demir Kapija, which are now all unoccupied.	CH
Amphibians		
Bombina variegata, fire belly toad (GRL- LC, NRL – LC)	The fire belly toad is Annex II and Annex IV species to the EU Habitat Directive. It is considered abundant in N. Macedonia, with a patchy, fragmented distribution pattern. According to some authors, the subspecies Bombina variegata ssp. scabra is considered endemic in the Balkans. It occurs in suitable habitats throughout the project area, in temporary and permanent ponds.	CH
Rana graeca, (GRL- LC, NRL – NT)	The Greek stream frog is an Annex IV species, widespread across the country but it is nevertheless limited to its appropriate habitats of forest and high-mountain streams and rivers. Within the project area, it is normally related to the tributaries of river Vardar, and along the Boshava and Doshnica rivers.	CH
Rana dalmatina, agile frog (GRL- LC, NRL – NT)	The agile frog is an Annex IV species. It occurs in glades and open sites within light deciduous woodland (oak, beech, hornbeam, etc.), and it is less frequent in meadows and thickets. This species may be found in the meadows near the noteworthy water bodies representing tributaries of river Vardar, as well as along the Boshava and Doshnica rivers.	CH
Hyla arborea, European tree frog (GRL- LC, NRL – NT)	An Annex IV species, but with a wide distribution, common in suitable habitats in the country. The species is not so widely abundant in the area of interest, and its distribution is associated with larger rivers and springs.	CH
Bufotes viridis, green toad (GRL- LC, NRL – LC)	This species is considered moderately abundant to common over large parts of its range in the country. A couple of monitoring studies from the last four years hint that the species population trends across the country are stable. It is widely abundant throughout the affected area.	CH
Reptiles		
Testudo hermanni, Hermann's tortoise (GRL- NT, NRL – VU)	An Annex IV and Annex II species to EU Habitat Directive. According to the National Red List of Reptiles of North Macedonia (2021), it is categorised as Vulnerable. The Hermann's tortoise prefers shrubs or openings in thermophilic forests, in our country most often oak or degraded forests of predominantly Jerusalem spine and/or false acacia. In the project area, it is present at lower altitudes (up to 800 m), in hilly and open forest places.	CH
Testudo graeca, Greek tortoise (GRL- VU, NRL – VU)	An Annex IV and Annex II species to EU Habitat Directive. According to the IUCN Global Red List of Threatened Species and National Red List of Reptiles of North Macedonia (2021), it is categorised as Vulnerable. It is much more thermophilic than the Hermann's tortoise. In the project area, it is present at lower altitudes with a preference for open habitats of small bush and shrub, degraded secondary growth habitats or sandy slopes, rather than forests.	CH
Lacerta trilineata, the Balkan green lizard (GRL- LC, NRL – LC)	The Balkan green lizard occurs in a broad range of habitats, usually with plenty of vegetation, such as forest edges, open woods, hedgerows along roads and paths, scrubland, overgrown fields, and gardens. It is widely dispersed in the country as well as in the project area at lower altitudes (up to 1,200 meters) on hilly and open forest sites.	CH
Lacerta viridis, green lizard (GRL- LC, NRL – LC)	The green lizard is a ubiquitous species in N. Macedonia, present in many habitats and localities, and it can be found within the boundaries of or around man-made habitats. It is very common in the country and in the project area at lower altitudes (up to 1,200 meters) in hilly and open forest locations.	CH

Species	Status within Broader Area of Analysis	Status
Podarcis muralis, the common wall lizard (GRL- LC, NRL – LC)	An Annex IV species, but with a wide distribution, tolerance of a broad range of habitats, presumed large population. The common wall lizard is a ubiquitous species in N. Macedonia, present in scores of habitats and localities, and it is one of the most successful species in man-made habitats. It is widely distributed in the project area.	CH
Dolichophis caspius, the Caspian whip snake (GRL- LC, NRL – LC)	The Caspian whip snake is found in dry areas of open scrubland and woodland, steppe and other grasslands, rocky hillsides, overgrown areas, vineyards, rural gardens, stone walls, and ruins. It is extensively distributed in the country as well as in the project area at lower altitudes (up to 900 m) in meadows, and on hilly sites.	CH
Coronella austriaca, smooth snake (GRL- LC, NRL – LC)	An Annex IV species, but with a wide distribution, tolerance of a broad range of habitats. It is the most common in upland or montane areas, and overall in hilly terrain. In the project area, it occupies various habitats from the plains all the way to forest areas and stony peaks.	CH
Zamenis longissimus, the Aesculapian snake (GRL- LC, NRL – LC)	The Aesculapian ratsnake is widely distributed in the country. It is by and large found in arid, open woodlands, forested ravines, rocky outcrops, field edges, orchards, stone walls, and old buildings. In the project area, it occurs in forest and riparian belts.	CH
Natrix tessellata, dice snake (GRL- LC, NRL – LC)	The dice snake is widely distributed in North Macedonia. It is highly aquatic, nearly always found close to or in bodies of water. It tends to occupy larger water bodies when it coexists with grass snake. Within the project area, it is habitually connected to greater rivers, such as the river Vardar, the Boshava and Doshnica rivers.	CH
Vipera ammodytes, the nose-horned viper (GRL- LC, NRL – LC)	The nose-horned viper is very widespread in the country. This species is associated with rocky areas but it tends to be opportunistic in other habitats. It occurs in dry, often rocky habitats, including open woodland and scrub, sand dunes, hillsides, screes, stone walls, traditionally cultivated land, etc. It equally favours man-made or natural rock formations. This species is also broadly dispersed in the project area, occupying various habitats.	CH
Invertebrates		
Zerynthia polyxena, The southern Festoon.	The southern Festoon (Zerynthia polyxena) is a butterfly species listed in Annex IV of the EU Habitats Directive. In North Macedonia, it is distributed throughout the country with most of the records in the valley or rivers Crn Drim, Treska, Crna Reka, Kriva Reka and Vardar. It inhabits meadow, especially along rivers as well as forest clearings. Only one specimen was observed in a oak forest clearing at the locality Manastirska Cuka which is cca 4 km away from the pipeline (outside of any project impact).	CH
<b>Potential Critical Habitat/PBF Triggers: Habitats of Significant Importance to Endemic or Geographically Restricted Species</b>		
Species	Status within Broader Area of Analysis	Status
Helix philibinensis (GRL-LC; south-Balkan endemic)	Helix philibinensis is only known from a small area in the Central Balkan, from the region around the Ohrid Lake to the east as far as the Island of Thasos. Interestingly, it inhabits a wide range of habitats, from the lowlands up to mountain peaks which reach almost 2000 m altitude. In the area of interest it was recorded in dry grasslands (6220* Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea), between Negotino and Demir Kapija. Common species in these habitat types in the whole Vardar valley. Its AOO is estimated at 80km <sup>2</sup> , while EOO is 40000km <sup>2</sup> (Páll-Gergely 2011)	CH

#### 4.3.2 Analysis of Potential PBF Habitats

##### Potential PBF triggers: Threatened Habitats

Species	Status within Broader Area of Analysis (DMU)	Status
EU HD Annex I Habitats		
6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco brometalia) (*important orchid sites)	1 habitat of pan-European interest, listed in Annex I to the HD, but widespread in N. Macedonia; 6 plant species of biogeographical significance; 3 fungal species, 1 Least Concern (GRL); 1 Near Threatened (NRL); 1 new for the country; 1 regionally endemic insect (ground beetle); 3 nesting birds with unfavourable conservation status: 2 are Least Concern and 1 is Near Threatened (GRL and ERL); all are EUBDA1; 2 Least Concern reptiles (snakes) (GRL, ERL and NRL), EUHDA4. 4 mammals EUHDA2; EUHDA4; all are Least Concern (GRL and ERL); The current habitat is largely distributed in the country. The plant communities affiliated with this habitat type are secondary phytocoenoses derived from permanent degradation of forest associations, particularly in the oak belt.	PBF
92A0 Salix alba and Populus alba galleries	1 habitat of pan-European interest, listed in Annex I to the HD, but widespread in N. Macedonia. The riparian willow-poplar belt is present at the point where the pipeline traverses the river Vardar. In the willow and poplar belt, the False indigo-bushtree occurs at a number of spots as an invasive species.	PBF
92C0 Platanus orientalis and Liquidambar orientalis woods	1 habitat of pan-European interest, listed in Annex I to the HD, but widespread in N. Macedonia. The riparian willow-poplar belt is present at the point where the pipeline traverses the streams Drenska Reka, Gabreshka Reka, Zuica, Doshnica, Boshava and Kovanska Reka	PBF

##### Potential PBF Triggers: IUCN VU, Habitats II or Bird Directive I Species

Species	Status within Broader Area of Analysis	Status
Birds – IUCN VU species		
Aquila heliaca, Imperial eagle (GRL- VU; ERL – LC)	One pair of Imperial Eagles used to breed on a pylon in vicinity of Negotino (Dubrovo). The pair is not present for the last two years, but it can not be excluded that it has changed breeding location and is still present in the region. Non-breeding birds are occasionally observed in the southern parts of the project region, during dispersion/migration. Temporary habitat loss/disturbance are likely to affect eventually breeding birds.	PBF
Streptopelia turtur, the European turtle dove (GRL- VU; ERL – VU)	The Turtle Dove is common breeding bird species in the area of interest, with densities from 2 pa/km <sup>2</sup> , but locally reaching up to 7 pa/km <sup>2</sup> . Although point data are shown, it is actually present along the entire pipeline corridor. Although the European population is in steep decline, Macedonian breeding population still seems stable (or experiencing smaller decline). It will be affected by habitat loss and disturbance. On short term, but ground clearing will provide new feeding possibilities in the overgrown habitats. No specific mitigation measures might be implemented.	PBF
Birds – Bird Directive Annex I species		
Alectoris graeca, the rock partridge (GRL- NT; ERL-NT)	The Rock Partridge is a common species in rocky and scrubby areas in North Macedonia, and although it has been only sporadically registered in the study area, it should be regarded as more common. The effect from the project implementation will be small to negligible.	PBF
Apus apus, (GRL- LC; ERL-NT)	The Common Swift has declining populations throughout Europe, but its national situation is not well known. It is connected to urban centres for breeding and is an aerial hunter, and therefore will not be affected by the project implementation.	PBF

Species	Status within Broader Area of Analysis	Status
Coturnix coturnix, (GRL- LC; ERL-NT)	The Quail is another species declining in Europe, related to arable land and pastures. It has good populations in the southern part of the project areas (Gevgelija fields), about 2 pa/km <sup>2</sup> , that will be affected by the project implementation. The effects will be temporary and the population is expected to recover within one-two breeding seasons.	PBF
Caprimulgus europaeus, the European nightjar (GRL- LC; ERL-LC)	The Nightjar is common species in the woodland habitats along the pipeline (densities of about 1 pa/km <sup>2</sup> ) and its habitat will be affected on a medium-scale timeline, until the surface vegetation is recovered. No specific mitigation measures are possible, except avoiding the construction activities in the breeding period (April-June) to minimize disturbance and nest losses, which is general proposed measure.	PBF
Ciconia ciconia the white stork (GRL- LC; ERL-LC)	The White Stork is one of the triggering species for identification of the IBA Southern Vardar, and has good populations in the villages Bogorodica and Stojakovo in Gevgelija region (about 60 pairs breed in this region, (Putilin Stamkoska et al. 2020). The pipeline is foreseen to pass through feeding areas near Stojakovo (Gevgelija), and season restrictions Mar-Avg are needed.	PBF
Ciconia nigra, the black stork, (GRL- LC; ERL-LC)	The Black Stork breeds in Demir Kapija Gorge and uses Vardar river and its tributaries for foraging. During migration it can be expected along the entire corridor. It is highly sensitive to disturbance and habitat loss, but no nest is known in the vicinity of the corridor.	PBF
Ixobrychus minutus, (GRL- LC; ERL-LC)	Few pairs of the Little Bittern might be breeding in the sections of Lower Vardar River, where reed-beds exist. It will not be significantly affected by the construction of the pipeline.	PBF
Circaetus gallicus, the short-toed snake eagle (GRL- LC; ERL-LC)	The Short-toed Snake-eagle is common species in the Mediterranean woodland, especially on calcareous substrate, and several pairs (at least five) are found along the project corridor. They will be adversely affected by the pipeline construction, which will cause some disturbance and especially (foraging) habitat loss, which might reflect on the breeding success. These negative effects are expected to be of temporary nature, and their effects will likely become negligible within several years.	PBF
Circus pygargus, Montagu's harrier (GRL- LC; ERL-LC)	One or two pairs of Montagu's Harriers breed in the field near Gevgelija, and will be temporarily affected by the construction work (both disturbance and habitat loss). Under assumption that agriculture habitat will be restored anyway, avoidance of construction work between May 1st and July 30th is the only possible mitigation measure.	PBF
Coracias garrulus, the European roller (GRL- LC; ERL-LC)	Few pairs of Rollers scarcely breed in the riparian forests in Lower Vardar section. It might be affected only locally, near Gevgelija, if large poplar or plane trees are fallen for the project implementation. Therefore, as a mitigation measure, this practice should not be allowed (which will have positive impact for other species as well).	PBF
Dendrocopos medius, the middle-spotted woodpecker (GRL- LC; ERL-LC)	The Middle Spotted Woodpecker in the study area is connected with the riparian forests, and will be insignificantly affected by the project implementation. Its population seems already depleted in the pipeline corridor.	PBF
Dendrocopos syriacus, the Syrian woodpecker (GRL- LC; ERL-LC)	The Syrian Woodpecker is connected to orchards and is very common species in North Macedonia. Effects on its population from the project implementation will be negligible and temporary.	PBF
Emberiza hortulana, Ortolan (GRL- LC; ERL-LC)	The Ortolan Bunting is locally common species in Macedonia, and also along the project corridor. It is not expected to be significantly impacted by the project implementation, and the effects are going to be only temporary.	PBF
Falco naumanni, (GRL- LC; ERL-LC)	The Lesser Kestrel is one of the trigger species for the IBA Tikvesh Region. Its population in the pipeline corridor still seems to be strong (estimated to about 40 pairs), and will be negatively affected by habitat destruction (loss of foraging areas). This will lead to decline in the breeding success. Mitigation measures should include avoidance of the construction works in the pastures between April 1st and July 15th, and also reduction of other threats, as the likely electrocution on dangerous electricity poles in the region, which might be insulated as a compensatory measure.	PBF



Species	Status within Broader Area of Analysis	Status
Falco peregrinus, (GRL- LC; ERL-LC)	One pair of Peregrines breed in the wider are of the pipeline, in Demir Kapija Gorge, and individual birds are observed in the fields of Gevgelija in the breeding season. It ill not be significantly impacted by the project implementation.	PBF
Lanius collurio, the red-backed shrike (GRL- LC; ERL-LC)	The Red-backed Shrike is common species in the habitats with bushes in North Macedonia and along the project corridor. Its population will be directly affected by habitat loss, but not substantial mitigation measures can be proposed.	PBF
Lanius minor, the lesser grey shrike (GRL- LC; ERL-LC)	The Lesser Grey Shrike is locally present along the pipeline corridor. Effects on its population are goint to be temporary only. The national population is quite strong.	PBF
Lanius senator, (GRL- LC; ERL-NT)	The Woodchat Shrike is common and widespread species in the open woodlands and bushes and in the arable habitats along the project corridor (reaching 3-4 pa/km2) and in North Macedonia. The European populations are declining. Although the project implementation will cause temporary habitat loss, the population will recover and will benefit from the newly-established open areas along the pipeline.	PBF
Lullula arborea, the woodlark (GRL- LC; ERL-LC)	Some habitat loss is expected to affect the local population of the Woodlark, but the species is sommon and abundant in the appropriate habitats elewhere in North Macedonia.	PBF
Accipiter brevipes, (GRL- LC; ERL-LC)	The Levant Sparrowhawk is typical bird of prey for the Lower Wardar region (both Demir Kapija and Gevgelija) and tis area is the core of its population in North Macedonia. The national population is small, possibly no more than 60 pairs. It breeds in the riparian forests, and some pairs will likely be affected by habitat loss and disturbance. Therefore, minimal destruction of the riparian forest should be secured throughout pipeline construction, both ar Boshava-Doshnica rivers and at Lower Vardar.	PBF
Alcedo atthis, (GRL- LC; ERL-LC)	Few pairs possibly breed along Vardar river in Gevgelija region, and might be locally affected by disturbance. Destruction of steep banks along the river, where this species breed (and the Sand Martin Riparia riparia have colonies) should not be allowed during project implementation.	PBF
Aquila chrysaetos, (GRL- LC; ERL-LC)	Active nest of one pair of Golden Eagles exist along one of the proposed alternatives of the pipeline (at Vrvot) and this alternative is to be abandoned. The construction will cause habitat loss and disturbance to this breeding pair, but the effect is expected to be temporary.	PBF
Bubo bubo, (GRL- LC; ERL-LC)	At least one territory od Eagle Owls is known in the project corridor, but the species is likely more common. Temorary disturbance and habitat loss are expected, but no significant impact in long term.	PBF
Buteo rufinus, (GRL- LC; ERL-LC)	Two to four pairs of Long-legged Buzzard are to be found along the project corridor, but will unlikely be affected by the project implementation, as they benefit from open habitats. Nest are not near to the projected corridor.	PBF
Curruca nisoria, (GRL- LC; ERL-LC)	The Barred Warbler is locally found in the project corridor, and its national population will be insignificantly affected by the project implementation.	PBF
Gyps fulvus, (GRL- LC; ERL-LC)	Colony of the Griffon Vultures exist near the project corridor (above village Klisura, Demir Kapija), and one of the pipeline alternatives passess very close to the colony (at locality Vrvot). This alternative is to be avoided. The other alternative, due the topography of the terrain, will not be affect the colony. Although birds from the colony rarely use the corridor area for foraging, they will not be significantly affected by habitat loss and disturbance.	PBF
Hieraaetus pennatus, (GRL- LC; ERL-LC)	Two to three pairs of Booted Eagles are to be found in the forests between Dren and Gaborvo, and one-two more around Stojakovo village. The construction will cause habitat loss and disturbance for this rare bird of prey which requires mature forest stands for breeding. Mitigation measures should include avoidance of the forest stands and avoidance of the construction work in the period March 15th – July 31st in the breeding areas for this species.	PBF
Melanocorypha calandra, (GRL- LC; ERL-LC)	The Calandra Lark is locally abundant in the fieldsnear Negorino and Gevgelija, and will be affected by habitat loss. Effects are going to be temporary and the population will recover within 2 years.	PBF

Species	Status within Broader Area of Analysis	Status
<i>Milvus migrans</i> , (GRL-LC; ERL-LC)	One or two pairs of the extremely rare Black Kite breed in the wider region od Demir Kapija, but will unlikely be affected by the project implementation as it is related to preserved forest stands which are not to be found along the project corridor. It however forages in sections of the pipeline corridor, so, some negative effect is still to be expected.	PBF
<i>Calandrella brachydactyla</i> , (GRL-LC; ERL-LC)	The Short-toed Larks locally breeds in the regions of Negotino and Gevgelija, but its main national strongholds are in the central and dry parts of North Macedonia, thus the project will have insignificant negative effect on the national population, which will also be temporary.	PBF
<i>Pernis apivorus</i> , (GRL-LC; ERL-LC)	One pair of Honey Buzard probably breeds in the in the Lower Vardar region, and will likely be unaffected wyt the construction works.	PBF
<i>Sternula albifrons</i> , the Little Tern (GRL- LC; ERL-LC) and <i>Sterna hirundo</i> , the Common Tern, (GRL- LC; ERL-LC)	Lower Vardar region is the only known breeding site for these Annex I species - the Little Tern and the Common Tern in North Macedonia, and will therefore require protection. mixed colony is located on a small island near village Gjavato, about 2 km from the foreseen project pipeline. The colony is about 30 pairs in total, equally divided between both species. Construction will cause foraging habitat loss and disturbance. Ideally, construction activities should be implemented in the period between August and March, to avoid any impact on the colony. Breeding on other river islands can not be excluded. Therefore, no alterations in the river bed are to be made with the construction works.	PBF
Fish		
Danube barbel, <i>Barbus balcanicus</i> (GRL – LC)	<i>Barbus balcanicus</i> is both categorised in Annex II and Annex V. In the Global Red List (IUCN), in addition to in the European and the Mediterranean Red Lists, the Danube barbel is categorised as a Least Concern species (LC). It is a range restricted, but common fish in the Vardar watershed.	PBF
Other		
<i>Morimus funereus</i> , the long-horned beetle (GRL – NT)	The longhorn beetle <i>Morimus funereus</i> is a saproxylic insect (Coleoptera, Cerambycidae) listed in Annex II of the EU Habitat Directive. It is also considered as Vulnerable species (VU) on the global IUCN red list of threatened species. It has dominantly European distribution. <i>Morimus funereus</i> inhabits well preserved forest ecosystem in North Macedonia with preference to oak forests, however it frequently occurs in riparian and beech forests. During the survey in 2022, only one specimen was recorded in the riparian forest [92C0: <i>Platanus orientalis</i> and <i>Liquidambar orientalis</i> woods ( <i>Platanion orientalis</i> )] at the confluence of the rivers Dosnica and Bosava.	PBF

### Potential PBF Triggers: Significant Biodiversity Features Identified by a Broad Set of Stakeholders or Governments

Status within Broader Area of Analysis		Status
Key Biodiversity Area and nationally and internationally important species		
IBA Tikves region	The area is important because of the presence of two Egyptian vultures ( <i>Neophron percnopterus</i> ) in its southern part, and also because of the presence of 230 to 250 nesting pairs of the lesser kestrel ( <i>Falco naumanni</i> ), which is nesting only in the villages and it is present in the northern part of the area. In the northern part of the area, 1-2 pairs of imperial eagle ( <i>Aquila heliaca</i> ) are nesting, as well as at least one pair of lanner falcon ( <i>Falco biarmicus</i> ). Also, the largest colony (60 to 90 pairs) of grey heron ( <i>Ardea cinerea</i> ) exists in this region. The line gas pipeline corridor penetrates more than 10 KM in the area (point KM 57+000).	PBF
IBA Demir Kapija Gorge	The Demir Kapija Canyon is one of the richest ornithological reserves in Europe by the presence of rare birds of prey: griffon vulture ( <i>Gyps fulvus</i> ), Egyptian vulture ( <i>Neophron percnopterus</i> ), golden eagle ( <i>Aquila chrysaetos</i> ), short-toed snake eagle ( <i>Circaetus gallicus</i> ), long-legged buzzard ( <i>Buteo rufinus</i> ), various falcons ( <i>Falco peregrinus</i> , <i>F. naumanni</i> ), as well as some	PBF

Status within Broader Area of Analysis		Status
	less common species of birds such as <i>Hieraaetus pennatus</i> , <i>Milvus migrans</i> , <i>Falco biarmicus</i> , <i>Cerchotrichas galactotes</i> etc. The gas pipeline corridor intersects the area between KM 47+250 to KM 48+800 and from KM 50+800 to KM 52+250, in the total length of 3 KM.	
IBA Lower Vardar	The area has been identified as an important area for nesting of two species of terns ( <i>Sterna hirundo</i> and <i>Sternula albifrons</i> ), as a nesting area of almost 10% of the national white stork population ( <i>Ciconia ciconia</i> ) and as a potential bottleneck for migration of large floating species of birds (birds of prey, storks, etc.) In addition, the flood meadow of the Gjol area (in the vicinity of the village of Bogorodica) is an important stop-over site for many wintering species in this part of North Macedonia. This includes several species of duck and egret families, and the greater flamingo ( <i>Phoenicopterus roseus</i> ) has been spotted on several occasions. Also, this locality is crucial in the feeding of the breeding non-resident species such as the large nesting populations of white storks in the villages of Stojakovo and Bogorodica. The line gas pipeline corridor intersects the area between KM 0+000 and KM 9+500 and KM 10+500 and KM 13+000, in the total length of 12 KM.	PBF

#### Potential PBF Triggers: Ecological Structure and Functions Needed to Maintain the Viability of Priority Biodiversity Features.

Status within Broader Area of Analysis (DMU)		Status
Rivers and streams (3260)	1 habitat of Pan-European interest in an average condition; Presence of the restricted-range Danube barbel ( <i>Barbus balcanicus</i> ) is both categorised in Annex II and Annex V to the Habitat Directive. The European otter, near threatened (NT) in Europe and the Mediterranean Basin, EUHDA2, EUHDA4.	PBF

## 4.4 Summary of CH/PBF's

Based on the above analysis, the following CH/PBF Triggers have been identified:

TRIGGER	HABITATS/SITES/SPECIES	STATUS
Designated sites	IBA Tikves region	PBF
	IBA Demir Kapija Gorge	PBF
	IBA Lower Vardar	PBF
Habitats of significant importance to notable (rare, endemic or restricted range) species	91AA* Eastern white oak woods;	CH
	6220* Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea;	CH
	3280 Constantly flowing mediterranean rivers with Paspalo Agrostidion species and hanging curtains of Salix and Populus alba).	PBF
	92A0 Salix alba and Populus alba galleries	PBF
	92C0 Platanus orientalis and Liquidambar orientalis woods;	PBF
Significant biodiversity features	Rivers and streams	PBF
Mammals	Wolf ( <i>Canis lupus</i> );	CH
	Wild cat ( <i>Felis silvestris</i> );	CH
	European otter ( <i>Lutra lutra</i> );	CH
	Forest dormouse ( <i>Dryomys nitedula</i> )	CH

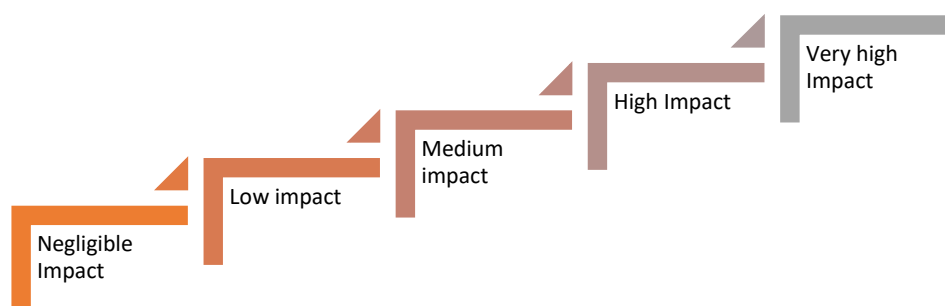
TRIGGER	HABITATS/SITES/SPECIES	STATUS
	<i>Bats (8 species).</i>	CH
Birds	<i>The Egyptian vulture (Neophron percnopterus);</i> <i>The European turtle dove (Streptopelia turtur);</i> <i>The eastern imperial eagle (Aquila heliaca).</i>  <i>33 nesting species on Bird Directive Annex I (Alectoris graeca, Apus apus, Coturnix coturnix, Caprimulgus europaeus, Ciconia ciconia, Ciconia nigra, Ixobrychus minutus, Circaetus gallicus, Circus pygargus, Coracias garrulus, Dendrocopos medius, Dendrocopos syriacus, Emberiza hortulana, Falco naumanni, Falco peregrinus, Lanius collurio, Lanius minor, Lanius senator, Lullula arborea, Accipiter brevipes, Alcedo atthis, Aquila chrysaetos, Bubo bubo, Buteo rufinus, Curruca nisoria, Gyps fulvus, Hieraaetus pennatus, Melanocorypha calandra, Milvus migrans, Calandrella brachydactyla, Pernis apivorus, Sternula albifrons and Sterna hirundo). Additionally, 18 non-nesting birds are listed in Annex I of the Birds Directive.</i>	CH PBF PBF  PBF
Amphibians	<i>Yellow-bellied toad (Bombina variegata);</i> <i>Greek stream frog (Rana graeca);</i> <i>Agile frog (Rana dalmatina);</i> <i>European tree frog (Hyla arborea);</i> <i>Green toad (Bufotes viridis).</i>	CH CH CH CH CH
Reptiles	<i>Herman's turtle (Testudo hermani);</i> <i>Balkan green lizard (Lacerta trilineata);</i> <i>Green lizard (Lacerta viridis);</i> <i>Common wall lizard (Podarcis muralis);</i> <i>Caspian whip snake (Dolichophis caspius);</i> <i>Smooth snake (Coronella austriaca);</i> <i>Aesculapian snake (Zamenis longissimus);</i> <i>Dice snake (Natrix tessellata);</i> <i>Nose-horned viper (Vipera ammodytes).</i>	CH CH CH CH CH CH CH CH CH
Fish	<i>Danube barbel (Barbus balcanicus).</i>	PBF
Invertebrates	<i>The southern Festoon (Zerynthia polyxena);</i> <i>Helix philibinensis;</i> <i>Long-horned beetle (Morimus funereus).</i>	CH CH PBF

## 5. Impact Assessment

Potential impacts on sensitive receptors within the AoI and PZI (identified in chapter 4), have been assessed. A specific mitigation is provided in the Biodiversity Action Plan (which is a separate document), only provided for sensitive Habitats and Species under impact, while impacts to other receptors is included within the GIP mitigation (Good International Practice). The zone of direct influence or Project's physical footprint is the 25m (12.5 m of each side) along the Project route. Indirect impacts are expected due to the construction of access roads, material storage areas, quarries etc within 2km.

### 5.1 Impact assessment methodology

Full details of the impact assessment methodology, tables, mitigation and residual impacts are provided in supp. ESIA. Impacts are rated on the following scale:



Consequently, the following tables provide a rating explanation. Sensitive designated areas in the project AoI are Important Bird Areas, so impact ratings for species are used for them.

Table 25. Habitat Impact rating

Negligible	Low impact	Medium impact	High impact	Very High
Impact on habitats				
Impact is within normal range of variation.	Localized impacts to natural habitat	Small-scale loss of natural habitat	Large-scale loss of natural habitat, or small-scale conversion of "critical" habitat (e.g., known to be occupied by species with EN status)	Large-scale loss of "critical" habitat (e.g., known to be occupied by species with a conservation status of EN), or small-scale loss of "critical" habitat (e.g., known to be occupied by species with a conservation status of CR)

This methodology considers irreplaceability and vulnerability of species and magnitude and type of habitat lost. Conservation status of the species <sup>16</sup> is evaluated with and without the project. The consequence of an impact to a biodiversity value may range from negligible, low (i.e., no net loss of species/localized impact to natural habitat) to very high (e.g., loss in value with status of CR of the species or large-scale loss of critical habitat).

<sup>16</sup> IUCN conservation status categories for species are: Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), Critically Endangered (CR), Extinct in the Wild (EW), and Extinct (EX).



Table 26. Species impact rating

Negligible	Low impact	Medium impact	High impact	Very High
Impact on species				
Impact is within normal range of variation.	No net loss in biodiversity value, regardless of conservation status	Net loss in value with a status of LC, NT or VU	Net loss in value with a status of EN, or status of a value changes to EN due to project impact	Net loss in value with a status of CR, or status of a value changes to CR due to project impacts

## 5.2 Impact identification and categorisation

The purpose of this step is to identify potential project impacts to those biodiversity values identified in the baseline study as requiring impact assessment. Impacts can be categorized in terms of:

- direct impacts – the physical footprint of project activities (including gas pipeline and the incremental transportation infrastructure required to support it) plus the area affected by emissions and effluents;
- indirect impacts – the physical footprint of non-project activities in the surrounding area that are caused or stimulated by the project plus the area affected by their emissions and effluents; and
- cumulative impacts – the overall impacts occurring in the project landscape caused by the project and non-project activities (related and unrelated to the project), generally including clusters of projects, land use change trends, and/or foreseeable developments.

A review of all project activities during construction, operations, are included. Based on these project activities, a comprehensive list of potential impacts to biodiversity is developed. Potential impacts are those that could occur in the absence of management within the project's area of influence, as described in the Biodiversity Baseline Study. Examples of biodiversity impacts (either directly caused by the project or indirectly caused by activities linked to the project) and their effect include:

### Habitat loss:

- Vegetation clearance for the preparation of the working corridor;
- Construction of pipe laydown areas;
- Vehicles causing soil compaction and erosion;
- Dust produced by vehicles causing reducing the fitness of plants and therefore habitats.

### Habitat Conversion:

- Conversion of habitats in order to maintain a RoW along the route;

### Habitat fragmentation:

- From disruption to routes through which fauna utilise to move through the landscape, both physically and through creating barriers of disturbance;

### Changes in water conditions

### Habitat pollution; including deposition and runoff:

Dust emissions can pose a number of problems including detrimental effects on health, nuisance problems and effects on vegetation such as:

- Covering of the leaf surface, resulting in shading and consequently reduction in net photosynthesis, altered pigment levels and/or reduced productivity;
- Additional nutrients from the dust that may lead to increased growth and or deficiencies;
- Changes in pH levels over time if the dust has different pH conditions to surrounding soils;
- Soil pollution via deposition from the air or water run-off;
- Creation of a surface film on still water bodies.

### Possible direct mortality of fauna due to vegetation clearance and pollution:

### Possible direct mortality to fauna due to interactions with workers and through the consumption of wastes / food brought into the works area;

↪ Disturbance to species including visual and noise disturbance:

- Construction noise and visual disturbance can result in short term, localised effects;
- Birds are amongst the best studied animal receptors in response to noise.

↪ Spread of non-native or invasive species.

These impacts can be divided by project phase:

**Construction impacts:**

Potential impacts upon biodiversity are derived from multiple sources relating to pipeline construction and associated activities such as:

- Vehicle mobilization, including transport of people and equipment;
- Waste generation, interactions with wildlife and indirect pressure of workers' presence;
- Pipeline working corridor vegetation clearance and topsoil removal;
- Pipeline construction activities including disturbance of soils and the potential for indirect and direct pollution from construction including access roads, material storage areas, quarries and individual river crossings;
- Unlikely Events; and
- Cumulative effects.

**Operational Impacts:**

Operational impacts are associated with the maintenance of the Rights of Way (RoW) of the pipeline<sup>17</sup>.

Expected impacts are:

- Increase in hunting or predation utilising the RoW for access;
- Spread on non-native invasive species along the maintained RoW or transferred during maintenance of the RoW;
- Impacts upon habitats and species directly resulting from the maintenance of the RoW;
- Increased disturbance due to increased accessibility and activity during maintenance; and
- Visual, noise and air quality issues related to the operation of the compressor stations.

## 5.3 Summary of Impact Assessment Results

Full results of the impact assessment are presented in Table 26.

*Table 26. Potential Impact Assessment Results (by Impact Character)*

Issue	Potential Impacts
Habitat loss, conversion, degradation	Permanent conversion of forest habitats to grass and shrubland within 7m wide ROW
Fragmentation	The fragmentation of habitats is largely temporary and unlikely to result in a significant effect on populations.
Changes in water conditions (hydrological impacts)	Two construction methods for water crossings have been proposed. The technology of construction of crossings under rivers and canals is prescribed by the Contractor with the approval of the Supervisory Authority.  A series of pollution prevention measures will be used as appropriate per crossing type. These will involve; retaining vegetation cover on the banks where possible to minimize the soil exposure, the use of silt fences to prevent silt from travelling downstream, minimizing the duration of trenching by back filling as rapidly as possible and restoring banks to pre-construction contours using temporary erosion control measures

<sup>17</sup> the access roads, material storage areas, quarries and individual river crossings

Issue	Potential Impacts
	Pre-clearance site surveys will target sensitive vegetation and apply additional mitigation where required. Reinstatement of banks will use mid-term soil stabilization measures if required such as willow revetments, to retain soil until the vegetation has established.
Habitat pollution; including deposition and runoff;	GIP mitigation will ensure that there are no significant impacts from run off. On the river crossing, mitigation and monitoring by the Biodiversity Specialists will ensure no significant effects
	With regards to dust, for this site it is anticipated that PM10 in the absence of mitigation would result in effects from dust being minor with an effect up to 50m from the source. With the proposed mitigation in supp. ESIA, it would be reduced.
Direct mortality	Locating construction camps (to storage equipment) away from sensitive areas and enforcing a hunting ban on construction workers will help ensure that there are no significant adverse effects, along with good site practice regarding the storage of waste and food.
	Speed limits on vehicles and restrictions to existing and/or dedicated haul routes will prevent direct mortality and disturbance from vehicles;
	In addition to a hunting ban, pre-clearance site surveys and the movement of animals out of the working corridor by the Biodiversity Specialist, combined with timing of works in sensitive areas will prevent direct mortality. There may be some low level unavoidable direct mortality but this would not be significant in the short or long term.
Disturbance to species including visual and noise disturbance	Construction noise and visual disturbance will result in short term, localized effects, although many animals will become habituated to the noise.
	The noisiest activities associated with the development are those from static plant used to excavate trenches, clear vegetation, lay pipes, hammering and compacting concrete. The noise levels at the site are likely to be in excess of 80dB decreasing to 50 to 64dB at 300m. This is likely to result in abandonment of the areas closest to the construction sites although there may be a degree of habituation. Blasting will also impact sensitive species.
	This will result in a short-term adverse effect, however the most sensitive habitats and species, works will be confined to the least sensitive timeframes. Monitoring by Biodiversity Specialists will also ensure that should valuable species be breeding in an area, works do not take place during these sensitive times i.e. for birds that the young have successfully fledged.
Spread of non-native or invasive species.	Pre-clearance surveys combined with the demarcation and treatment of non-native species will prevent their spread. Monitoring post-construction will ensure that newly restored areas are not inundated with non-native species from adjacent areas.

### 5.3.1 Impacts to Designated Sites

Potentially significant impacts to designated sites (IBA Tikves region, IBA Demir Kapija Gorge, IBA Lower Vardar) which trigger PBF can be summarized in Table 26 below.

Table 27. Potential impacts to designated sites

Issue	Description
<b>Construction Impacts</b>	
Direct impacts	Impacts have generally been limited through appropriate route selection. Avoidance has been made to Monument of Nature Demir Kapija, IPA Demir Kapija Canyon and the eponymous Emerald Area. Thus, the impact, primarily on the rare species of birds of prey, as well as on rare and endemic plants, has been minimized in this region (as it stresses in the original ESIA). Even so, due to the presence of many rare birds of prey in the IBA Tikves, IBA Demir Kapija and good bird population in IBA Lower Vardar, the impact in the Construction phase is <b>assessed as medium</b> .
Indirect impacts	A further proposed protected areas may be indirectly impacted, through fragmentation, disturbance or pollution. Impacts to these sites will be addressed through timings of the works, working methodologies and other control measures. Due to the vicinity of other important areas use of natural breaks in vegetation as preferred access routes is proposed as GIP. No significant residual effects on these sites is foreseen

Issue	Description
<b>Operational Impacts</b>	
Operational Impacts	During the operation of the project, impacts upon IBA sites identified are related to the maintenance of a Right of Way along the Route and invasive species management. If the mitigation is correctly implemented, no additional significant residual effects are anticipated.

### 5.3.2 Impacts to Habitats

A number of notable habitats, have been assessed as having the potential to be impacted by the construction. Mitigation for impacts to habitats is presented in the GIP and in BAP.

Table 28. Potential impact to habitats

Issue	Description
<b>Construction Impacts</b>	
Direct impacts	<p>A number of notable habitats, have been assessed as having the potential to be impacted by the construction. These include woodlands and notable grasslands. The route has largely been selected to avoid impacts to these areas (e.g. by following existing oil pipeline routes, HDD etc.), however impacts, including habitat loss, fragmentation and degradation and potential pollution impacts, do require mitigation.</p> <p>Construction impacts to CH 6220 may impact 4.9 ha, which represents <math>\approx 0.019\%</math> of the habitat's EAAA (25,225 ha). This impact is not considered likely to compromise the habitat's integrity across the EAAA given the relatively small area. There are no global estimates for 6220* available, but the habitat occurs mainly in Europe. European estimate (EU only) of 6220* – 706,122 ha. Mediterranean estimate (EU only) – 693,747 ha (98% of EU total), there is no National estimate of 6220*. This impact is not considered likely to compromise the habitat's integrity. The impact magnitude is therefore considered to be <b>low</b>.</p> <p>Construction impacts to CH 91AA may impact 0.075ha. The habitat is likely the most widespread habitat type in N. Macedonia, extending to three climate-zonal areas. The project activities will lead to habitat loss and fragmentation. The impact in the Construction phase is <b>assessed as low to medium</b>.</p> <p>Construction impacts to 92C0 <i>Platanus orientalis</i> and Liquidambar orientalis woods (Platanion orientale).(PBF) are expected to result in a loss of 1.275 ha. This impact is not considered likely to compromise the integrity of habitat across the EAAA given these low losses. Due to the importance of this habitat the impact magnitude to this PBF is therefore considered to be <b>low to medium</b>.</p> <p>Construction impacts to riparian willow belts (PBF) are expected to have impact of 0.3 ha, This impact is not considered likely to compromise the integrity of habitat across given these relatively low losses. The impact magnitude to this PBF is therefore considered to be <b>low</b>. GIP could mitigate impact upon this habitat.</p>
Indirect impacts	Indirect impact from access roads, GMRS, construction camps etc. could lead to fragmentation, disturbance or pollution of the habitats. Impacts to these sites will be addressed through construction camp and yard site selection, using existing access roads of other projects, timings of the works, working methodologies and other control measures. No significant residual effects on these sites is foreseen
<b>Operational Impacts</b>	
Operational Impacts	During the operation of the project, impacts upon IBA, IPA sites identified are related to the maintenance of a Right of Way along the Route and invasive species management. If the mitigation is correctly implemented, no additional significant residual effects are anticipated.

### 5.3.3 Impacts on Species

A number of notable species, have been assessed as having the potential to be impacted by the construction. Mitigation for impacts to habitats is presented in the GIP and in BAP.

Table 29. Potential impact on species

Issue	Description
<b>Construction Impacts</b>	
Direct impacts	<p>A number of notable species, have been assessed as having the potential to be impacted by the construction. These include amphibians, reptiles, birds, mammals, fish, insects. 29 were assessed as trigger CH and 37 being Priority Biodiversity features in line with PR6. The route has largely been selected to avoid impacts to these species (e.g. by following existing oil pipeline routes, HDD etc.), however impacts, include direct mortality from the construction works, from fragmentation of habitats, visual and noise disturbance and impacts from pollution.</p> <p>The impact magnitude is therefore considered to be <b>low to medium</b>.</p>
Indirect impacts	<p>Species could be under indirect impact through fragmentation, disturbance or pollution. Impacts to the species will be addressed through timings of the works, working methodologies and other control measures. No significant residual effects on these sites is foreseen</p>
<b>Operational Impacts</b>	
Operational Impacts	<p>During the operation of the project, impacts upon species identified are related to the maintenance of a Right of Way along the Route, potential noise from compress station, invasive species and the potential for increased hunting in the areas around the project route as accessibility would be increased. If the mitigation is correctly implemented, no additional significant residual effects are anticipated.</p>

## 5.4 Cumulative impacts

Separate Cumulative Impact Assessment (as a part of a supp.ESIA) in accordance with the IFC Good Practice Handbook which incorporates the critical habitat triggers and priority biodiversity features, cumulative impacts are not considered further in this document.

## 5.5 Anticipated threats

Climate change – No current data are yet available on the impact of climate change on the populations of species. Nevertheless, it can be anticipated that the extreme climate related events can have an effect on the reproductive success of the populations. Long dry periods, for example, caused by the change in the climate, increase the risk of wildfires and droughts that are direct limiting factor for populations.



## 6. Proposed Avoidance, Mitigation, Restoration and Offsetting

Once impacts are characterized, the mitigation plan follow the requirements for PBF and CH described in PR6 and GN6. It is likely to be fairly straightforward and include:

1. Good international practices for construction of a pipeline
2. A plan to avoid disturbing the CH, and if not possible a credible plan to restore and protect it
3. Species-specific management for species that cannot tolerate temporal loss of their habitat during the period of construction and restoration
4. A plan to control invasive species becoming established in disturbed ground.

Mitigation proposed follows the mitigation hierarchy<sup>18</sup>, whereby avoidance is the primary approach, to limit impacts, followed by mitigation, restoration and finally offsetting if necessitated. In addition to GIP, the following mitigation is proposed to address impacts to ecology and nature conservation.

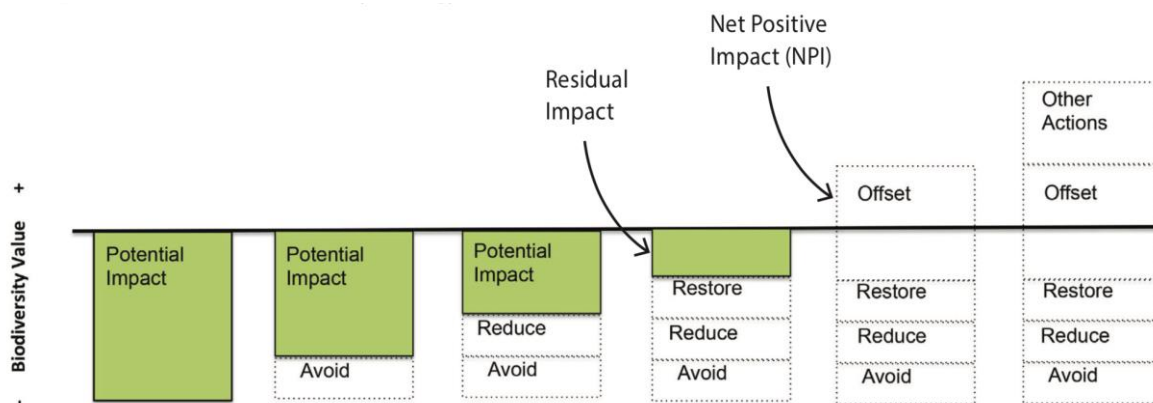


Figure 73. Mitigation Hierarchy

This would be developed further into a project Biodiversity Action Plan.

### 6.1 General Avoidance Overview

The project seeks to reduce impacts initially through avoidance. There are three major types of avoidance (CSBI, in preparation): Avoidance through Site Selection: Locate the entire project away from areas recognized for important biodiversity values. Avoidance through Project Design: Configure infrastructure to preserve areas at the project site with important biodiversity values. Avoidance through Scheduling: Time project activities to account for patterns of species behavior (e.g., breeding, migration) or ecosystem functions (e.g., river dynamics)

### 6.2 General Mitigation Overview

All of the works must be completed according to GIP (Good International Practice). GIP will be applied and delivered by the Biodiversity specialist. This will include measures such as pre-construction checks and destructive searches to minimise risks of animal mortality during construction. The Biodiversity specialist will also deliver Toolbox Talks to Project contractors to communicate good ecological practice (e.g., such as securing works areas, covering excavations, preventing access to non-works areas, etc.). This will prevent or reduce the impacts to receptors i.e., the duration, intensity and/or extent of impacts that cannot be completely

<sup>18</sup> The mitigation hierarchy comprises measures taken to avoid creating environmental or social impacts from the outset of development activities, and where this is not possible, to implement additional measures that would minimise, mitigate, and as a last resort, offset and/or compensate any potential residual adverse impacts

avoided. After the completion of the construction, the impacted areas are to be restored insofar as is possible. In order to mitigate for the impacts and with particular relevance to PR6 compliance, a comprehensive mitigation strategy (including (at least) like-for-like replacement for PBF habitat losses) and a replanting plan that secures a net gain in the extent of the EAAA will be implemented.

A Biodiversity Management Plan (BMP) should be produced for the in the pre-construction phase of the project, with details of the requirements for the Biodiversity Specialist. The BMP will specify the baseline condition of each habitat and species, the target condition and the recommended actions required to achieve this restoration. Specific details regarding mitigation measures will be provided within a BMP, to ensure No Net Loss/Net Gain is secured in perpetuity in accordance with EBRD PR6.

### 6.2.1 Pre-works surveys

Prior to works starting, the route must be fully surveyed for the up-to-date baseline condition and to identify the presence / potential presence of notable species. The survey must be conducted by suitably qualified Biodiversity specialist/s, at a suitable time of year and in line with PR6 should consider all priority biodiversity features. **This survey must be undertaken a minimum of two weeks ahead of the works to allow for any modification to the working methodology to be implemented if required.** The Biodiversity Specialist will be responsible for confirming that adequate information has been collected to ensure that there is an appropriate baseline to inform the bespoke mitigation and monitoring alternatively they will determine the appropriate pre-cautionary approach to take. As an experience from BRUA gas pipeline project in addition to pre-works survey, a component of the responsibilities of the Biodiversity Specialist will be to reassess the RoW ahead of the works through a 'walkthrough'. This will need to be conducted ideally one to two days ahead of the works to obtain up to date information on the presence of example nesting birds etc. Just before enabling works, a pre-commencement walks through should be done in order to identify presence of sensitive receptors such as nesting birds, sheltering reptiles etc. Look for potential presence of PBF species not identified as being present within the Aol.

## 6.3 GIP

The Biodiversity Specialist should ensure that the following GIP for identified impacts is followed at all times during the project. Table below outlines the GIP relating to biodiversity.

Table 30.GIP

IMPACT	Mitigation
Impacts due to scarcity of data	Sensitive habitats will be mapped ahead of time. In all sites where, sensitive habitats have been identified, bespoke mitigation will be used. This will enable for the identification of appropriate mitigation and the monitoring of the success of any cleanup. The Biodiversity Specialist should develop a monitoring report and hazard map with mapping of sensitive places and <b>provide it to the workers</b> so that sensitive regions can be avoided or bespoke mitigation can be performed. At least five non-native invasive plant species are known to be present along the route. Prior to any enabling works site survey, mapping and/or demarcation will be required, particularly for indigo bush (see invasive species mitigation plan) by the Biodiversity Specialist.
General impacts from works and operation – avoidance	Use of low-impact vehicles (in terms of emissions and load bearing) where applicable. Vehicles will be driven at designated speed limits. Off-road travel will be prohibited where possible. Laydown areas to be sited to avoid unnecessary clearance of vegetation. Use natural breaks in vegetation as preferred access routes where possible, but also access roads from another project, such as wind park Dren. The workforce will be provided with environmental awareness training and will adhere to working corridors. This is also applicable for worker camps- to be used from previous project in the area, such as construction of highway Demir Kapija -Smokvica (where applicable). Hunting and fishing ban on the workforce will be implemented. Waste to be disposed on designated sites to avoid wildlife approach.
Habitat loss	On flat areas, once topsoil has been restored and after any reseeded pull cut scrub and vegetation back onto the area to stabilise the soil and to promote natural re seeding. Critical habitats *6220 should be left for natural revegetation. For other habitats, identify a local source of indigenous saplings suitable for replanting programs in advance to facilitate restoration. Avoid the felling of significant tree, such as tall poplar and plane trees in riparian habitats. All efforts should be made to minimise removal of mature trees and maintain connectivity between areas of forest habitats. Educate workforce on preventing bush and forest fires.
Habitat degradation and simplification, erosion – General	Demarcation and offsets for camp and storage locations and field activities of at least 50m from watercourses. Erosion control should be implemented, as specified in the EIA and the relevant chapter of the supp. ESIA.
Habitat Loss, Degradation and minimising fragmentation – forests	Limiting working width to 10m in forest habitats. Avoid the felling of mature trees wherever possible. Restrict working hours to daytime preventing noise pollution during twilight. After gas pipeline installation, remediate impacts through restoration of impacted area as in specific mitigation in BAP and as specified in the programme of reforestation and reinstatement of vegetation cover. Restoration principles should be as follows unless there is bespoke specific mitigation for an area: <ul style="list-style-type: none"> <li>• 8m should be planted;</li> <li>• 7m should be kept clear as a maintained RoW.</li> </ul>
Habitat Loss, Degradation and minimising Fragmentation on - Riparian areas	The gas pipeline route will cross 3 main rivers through horizontal directional drilling to minimise impacts. Minimise works within riparian areas to safeguard aquatic organisms. Crossing points across other rivers will be conducted where there is clear access to the banks and vegetation clearance is minimised. Standard pollution control measures will be implemented i.e. to prevent silt contamination by keeping water out of the works area. Protection of the pump inlet for abstraction to avoid drawing in aquatic life and other debris will be required. Ensure reinstatement is like-for-like (i.e. bank makeup, shape etc. should be maintained). Where trees have to be removed to facilitate the crossing, these should be replanted with a similar species composition. Erosion control as specified in the appropriate chapter of the EIA, supp. ESIA should be installed.
Fragmentation from clearance of vegetation	When working in areas utilised by large carnivores such as grey wolf, do not sever entire forest block at any one time, stagger works to ensure that wildlife can traverse the forest block.

IMPACT	Mitigation
Habitat pollution due to run off into water and air pollution	Standard pollution control measures will be implemented i.e. to prevent silt contamination by minimizing the time spent on in water works, keeping water and sediment out of the works area using appropriate isolation techniques, as specified in the water chapter of the ESIA. The Biodiversity Specialist will determine when further monitoring (e.g. for turbidity) and/or bespoke mitigation for in water works are required. Dust emissions due to road travel shall be minimized by regulating vehicle speed and watering roads (where required). Spill kits should be continually available and standard industry refuelling protocols should be followed. Vehicle refueling and maintenance to be undertaken on a purposely provided drip tray. Erosion control as specified in the appropriate chapter of the supp.ESIA should be installed.
Direct mortality of notable species	<p>Biodiversity Specialist will be present during commencement of all works to conduct pre-construction checks, to prevent animals present within the working being killed or injured during the works. Checks will be for all vertebrate species such as ground nesting birds, reptiles, amphibians and bats. Checks will include within hollow trees and other places of shelter. As far as possible tree and scrub clearance will not be undertaken during the breeding bird season. Should clearance during this time be necessary a pre-clearance nesting bird check of the vegetation to be cleared will be undertaken by the Biodiversity Specialist and a decision on whether to move the nest or defer the clearance will be made by the Biodiversity Specialist. Biodiversity Specialist will be appropriately skilled/trained for undertaking site supervision and species relocations where required. The location of sensitive species identified by the Biodiversity Specialist will be reported to the workforce appropriately.</p> <p>Fill in pits and excavations as soon as possible following works; trenches and pits to be created for longer than 48h periods will have 45° ground ramps to allow escape by fauna (such as reptiles) should they fall in. A pre-start check for fauna will be completed prior to works commencing in the morning if trenches are left open overnight. Ensure wildlife can cross excavations, berms and drainage channels. Install regular crossing points.</p>
Disturbance to habitats and species Noise	Noise is likely to be highly localised and most receptors will likely avoid the noisiest areas or become habituated to certain noise. Some species may be particularly vulnerable and additional mitigation measures will be implemented (as appropriate). These may be greater offsets or timing of works (see specific mitigation). Monitoring noise emitted from machinery, using less noisy machinery where appropriate. Sensitive fauna has the potential to be affected by vibration and overpressure within 400 m of the blasting. Because construction will be progressive, any noise or blasting impacts will be short-lived. The blasting subcontractor will be required to provide a Blasting Management Plan demonstrating compliance with all approval conditions prior to the commencement of blasting activities.
Spread of invasive species (general)	<p>Use of native plants that are locally sourced for re-planting. Identify a local source of indigenous saplings suitable for replanting programs in advance to facilitate restoration. Monitor restored areas implement mowing etc. to control growth of non-native species (see operational mitigation).</p> <p>Store all food and food waste securely to prevent supporting populations of opportunistic species (which could include non-native invasive fauna such as the muskrat <i>Ondatra zibethicus</i> found in river Vardar on 8+500). A site wide ban on workers bringing vegetation or soil from outside the site area to prevent dispersion of non-native invasive species. Wash down of all vehicles and equipment before entering the sensitive sites (see specific mitigation).</p>
Operational Mitigation	During the operation of gas pipeline, maintenance of the RoW through forests will be required. Teams conducting this maintenance must be accompanied by a Biodiversity Specialist who will advise upon any sensitive areas and any remediation required. Vegetation removal within IBA sites must be conducted outside of March – September inclusive or a check for nesting birds must be conducted immediately prior to works commencing.
Unlikely events	<p>Full time presence of a Biodiversity Specialist during the daytime for the works in sensitive areas. Mitigation for unlikely events will include training of staff in:</p> <ul style="list-style-type: none"> <li>The sensitivities of the habitats and species in the area via toolbox talks including health and safety recommendations regarding poisonous or otherwise dangerous plants or animals, provided by the Biodiversity Specialist.</li> <li>Prevention of accidents by adhering to good practice behaviour throughout the works.</li> <li>Training in immediate response to bush/forest fire, spillages etc.</li> </ul> <p>Emergency numbers provided for Biodiversity Specialist should protected species be found on site in the absence of supervision.</p>

## 6.4 Mitigation and Restoration for Designated Sites

Within the designated sites, mitigation will be implemented via bespoke method statements that will be developed for the following sites:

- IBA Tikves region
- IBA Demir Kapija Gorge
- IBA Lower Vardar

Where these sites contain habitats identified as Critical Habitat or endangered species, these habitats will be replanted within the RoW, insofar as is possible whilst maintaining an access strip of 7m. Where this access strip is provided, offsetting will be required to ensure that the conditions of PR6 are met.

### 6.4.1 Bespoke Habitat Mitigation

In addition to the GIP mitigation, proposed construction mitigation in BAP for critical habitats identified along the route, will be made before construction commences.

### 6.4.2 Bespoke Species Mitigation

Bespoke species mitigation for sensitive species is presented in the BAP. These measures will be included within a bespoke method statement.



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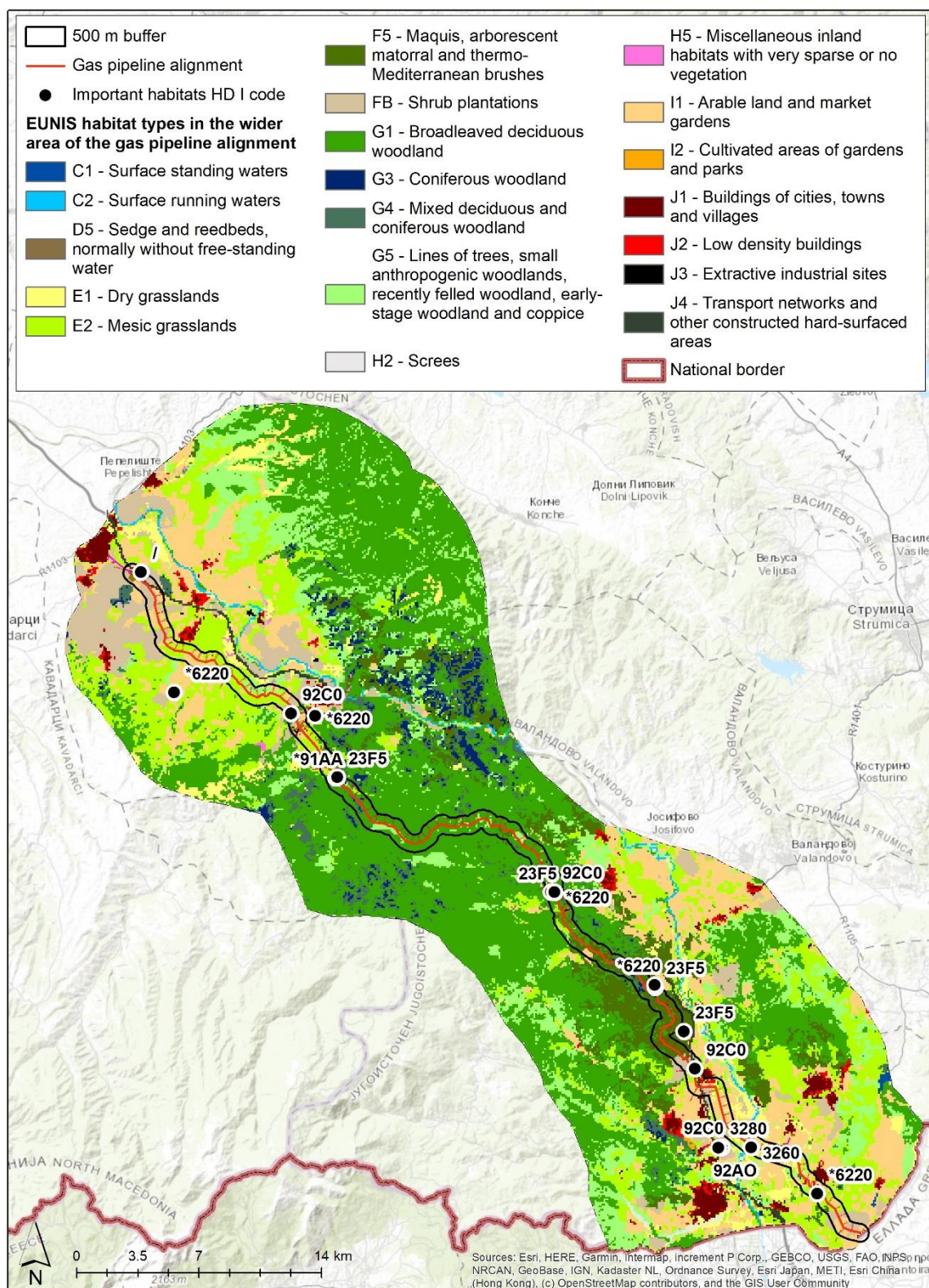
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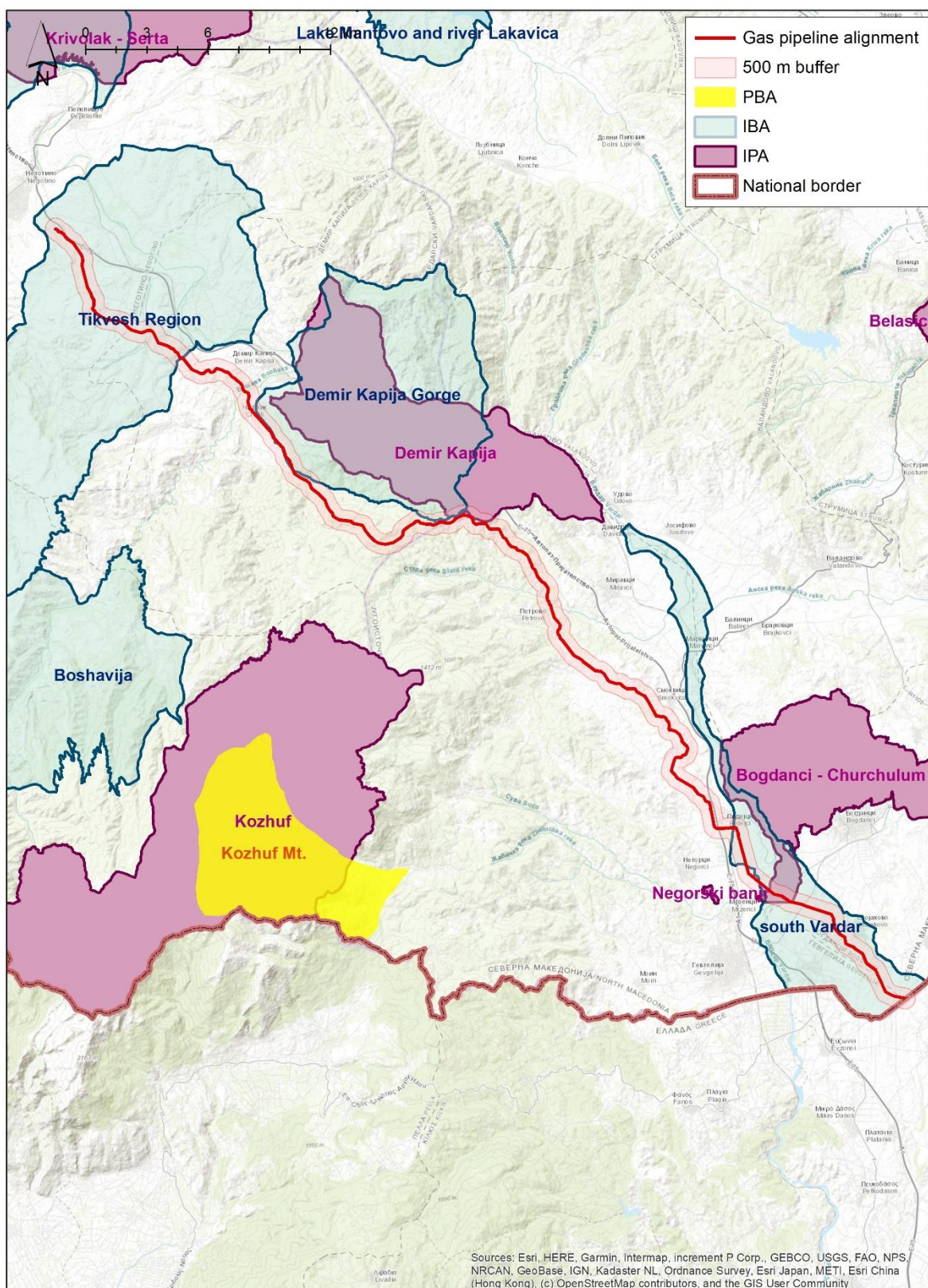
## 8. ANNEXES

### Annex 1. Habitat map





## Annex 2. Designated areas (IPA, IBA ,PBA)





## Annex 3. Emerald sites

